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2021-2031 NAGAGAMI FOREST MANAGEMENT PLAN

PLAN TEXT

Forest Management Plan – Title and Certification Page

Draft FOREST MANAGEMENT PLAN

for the

NAGAGAMI FOREST

Ministry of Natural Resources and Forestry's Wawa District, Northeast Region
Hornepayne Lumber Limited Partnership
for the 10-year period from April 1, 2021 to March 31, 2031

I hereby certify that I have prepared this forest management plan, including the silvicultural ground rules, to the best of my professional skill and judgement with the assistance of an interdisciplinary planning team in accordance with the requirements of the Forest Management Planning Manual and Forest Information Manual.

[R.P.F. Seal]

Shelley Straughan, R.P.F., Planning Forester
First Resource Management Group Inc., agent for Hornepayne Lumber LP
October 30, 2020

Jeff Barton, R.P.F., Project Manager
First Resource Management Group Inc., agent for Hornepayne Lumber LP
October 30, 2020

I recommend that this forest management plan be approved for implementation and certify that it has been prepared in accordance with the requirements of the Forest Management Planning Manual, the Forest Information Manual, and relevant policies and obligations (including any relevant MNRF agreements with Indigenous peoples). I also certify that the forest management plan has been prepared using the applicable forest management guides. In this forest management plan, prescriptions and conditions that differ from specific direction or recommendations in the applicable forest management guides are identified in the attached List of Exceptions.

Certified and Recommended for Approval by:

_____ _____
Paul Bernier, R.P.F. Date
District Manager, Wawa District, MNRF

_____ _____
Deb Weedon, R.P.F. Date
Regional Resources Manager, Northeast Region, MNRF

_____ _____
Grant Richie Date
Regional Director, Northeast Region, MNRF

Forest Information Portal Submission Identifier: [ID] _____
Original signed hard copies are filed at the MNRF Wawa District office and the Hornepayne Lumber LP office.

Application of Section 18 of the Endangered Species Act

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The Minister (or Minister's delegate) has formed the opinions specified in ss. 18(1)(e)(iii) of the *Endangered Species Act*, 2007 with regard to this forest management plan, which has the same effect as a permit issued under section 17 of that Act in respect of the following species:

Not applicable during this time. The FMP is not designated as an ESA Section 18 Overall Benefit Instrument.

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Name and Job Title	***Section(s) Prepared***	***Signature***	***Date***
Etienne Green, R.P.F. Planning Forester, FRMG	6.1 (b) LTMD Development		
Scott Lumb Forest Planner, FRMG	6.1 (b) Analysis Package, 6.1 (j), 6.1 (q), and FMP Plan Text Sec. 3 - 5		
Craig Heinrich Forest Operations Technician, FRMG	6.1 (r) Nagagami Compliance Strategy, 6.1 (v) Implementation Toolkit		
Derrick Romain Regional Planning Biologist, MNRF	6.1 (t) MEAs		
Sarah Sullivan, R.P.F. A/Regional Planning Forester, MNRF	FMP Plan Text Sec.2, 6.1 (e), 6.1 (k), 6.1 (l), 6.1 (n), 6.1 (o)		
Kathleen Cote Management Biologist, MNRF	FMP Plan Text Sec. 2		

Forest Management Plan – List of Exceptions

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All silvicultural treatments in the silvicultural ground rules that are exceptions to the recommendations in the silvicultural guides, and all operational prescriptions and conditions for areas of concern that are exceptions to the specific direction or recommendations (standards and guidelines) in the applicable forest management guides, are provided in this list of exceptions. The specific section of the forest management plan that provides documentation of the exception is also referenced in this list.

Description of Exception	Specific Section of Forest Management Plan

Forest Management Plan Contributors

FOREST MANAGEMENT PLAN for the NAGAGAMI FOREST

Ministry of Natural Resources and Forestry's Wawa District, Northeast Region
Hornepayne Lumber Limited Partnership
for the 10-year period from April 1, 2021 to March 31, 2031

PLANNING TEAM MEMERS

Shelley Straughan R.P.F.,	FRMG Inc. -	Plan Author
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Lisa Vanduskirk,		Brunswick House First Nation

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James Antler, Policy Advisor (Tourism)

LOCAL CITIZENS' COMMITTEE MEMBERS

Name	Interest Group/Affiliation	Membership Status
Marg Zajac	Roads Committee	CHAIR/Member
Matt Reid	Hornepayne Snowmobile Club	VICE CHAIR/Member
Denis Andre		*Alternate*
Darrel Gaudreau	Bear Management	Member
Steve Thuerig	Hornepayne Lumber LP	Non-member
Ryan Miles		Non-member
Scott Lumb	Forest Industry (First Resource Management Group)	Member
Jeff Barton		*Alternate*
Shelley Straughan		Non-member
Craig Heinrich		Non-member
Zac (Marion) Zajac	Hornepayne Anglers & Hunters	Member
Tracey Gagliardi		*Alternate*
Jon Peroff	Township of Hornepayne	Member
Belinda Kistemaker		*Alternate*
Betty McGie	Remote Tourism	Member
Paul Smart		Member
Laurette Potvin	Hornepayne Sunshine (Seniors) Club	Member
Kerry Wood	Bait Harvesters	Member
Ann Groulx	Hornepayne Métis Association & Hornepayne Trappers	Member
Boris Michelussi	General Public	Member
Caroline Biribauer	Secretary/Treasurer	Non-member
Sarah Sullivan	MNRF	Non-member

A brief statement which reports on the local citizens' committee's agreement or disagreement with the forest management plan (final plan only):

[statement]

PLAN REVIEWERS

Plan Reviewer Name and Position	Roles and Responsibilities
Adam Tomasini, Integrated Resource Management Technical Specialist	Operational Review
Derrick Romain, Regional Planning Biologist	Operational/Advisory Review, Preliminary Review
Kathleen Cote, Management Biologist	Operational Review, Preliminary Review
Tricia Young, District Planner	Operational Review
Bailey Young, A/Management Biologist	Operational Review
Jennifer Pine, District Resource Liaison Specialist	Operational/Advisory Review
Sarah Sullivan R.P.F., A/Forest Management Planning Specialist	Advisory Review
Gary Higgins, Regional Indigenous Advisor	Advisory Review
Kamala Rupakheti R.P.F., Regional Forest Analyst	Operational/Advisory Review, Preliminary Review
Heather Farrer R.P.F., A/Supervisor, Forest Industry Unit	Advisory Review
Aaron Stacey, EFR Fire Science Specialist	Advisory Review
Greg Kirkland, Fire Management Supervisor	Advisory Review
Gordon Kayahara R.P.F., Regional Forested Ecosystem Science Specialist	Advisory Review
Corey Young, Aggregates Technical Specialist	Operational Review
Shawn Fortin, Senior Lands & Waters Technical Specialist	Operational Review
Zachary White R.P.F., Resources Management Supervisor	Advisory review
Andre St. Louis, Regional GIS Officer	Operational/Advisory Review, Preliminary Review

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1.0 INTRODUCTION

The purpose of this Forest Management Plan (FMP) is to provide direction for the strategic forest management of the Nagagami Forest and to outline specific forest management operations for the ten-year planning period of 2021 to 2031. The forest management plan ensures that Ontario's publicly owned forests remain healthy and vibrant and that forestry operations and related activities are carried out in ways that support the sustainable management of all the forest resources found on the Nagagami Forest for generations to come. Before any forestry activities can take place, such as providing access, harvesting trees, renewing the forest, maintenance, and planning, an approved forest management plan must be in place.

The Nagagami Forest is located within the MNRF administrative District of Wawa, which in turn is located within the Northeast Region. The Northeast Regional office is in South Porcupine. Figure 1 illustrates the boundaries and location of the Nagagami Forest in the context of MNRF's Northeast Region. It is also noteworthy that the 'Centre of Ontario' has been geographically marked north-northwest of Hornepayne (Steer and Emblin, 2019). When you measure the exact middle of the longitude and latitude in Ontario, using the extremities, it takes you to the centre of the province, in the Nagagami Forest. The management unit encapsulates the village of Hornepayne which is located ~100 km south of highway 11 between Hearst and Longlac.

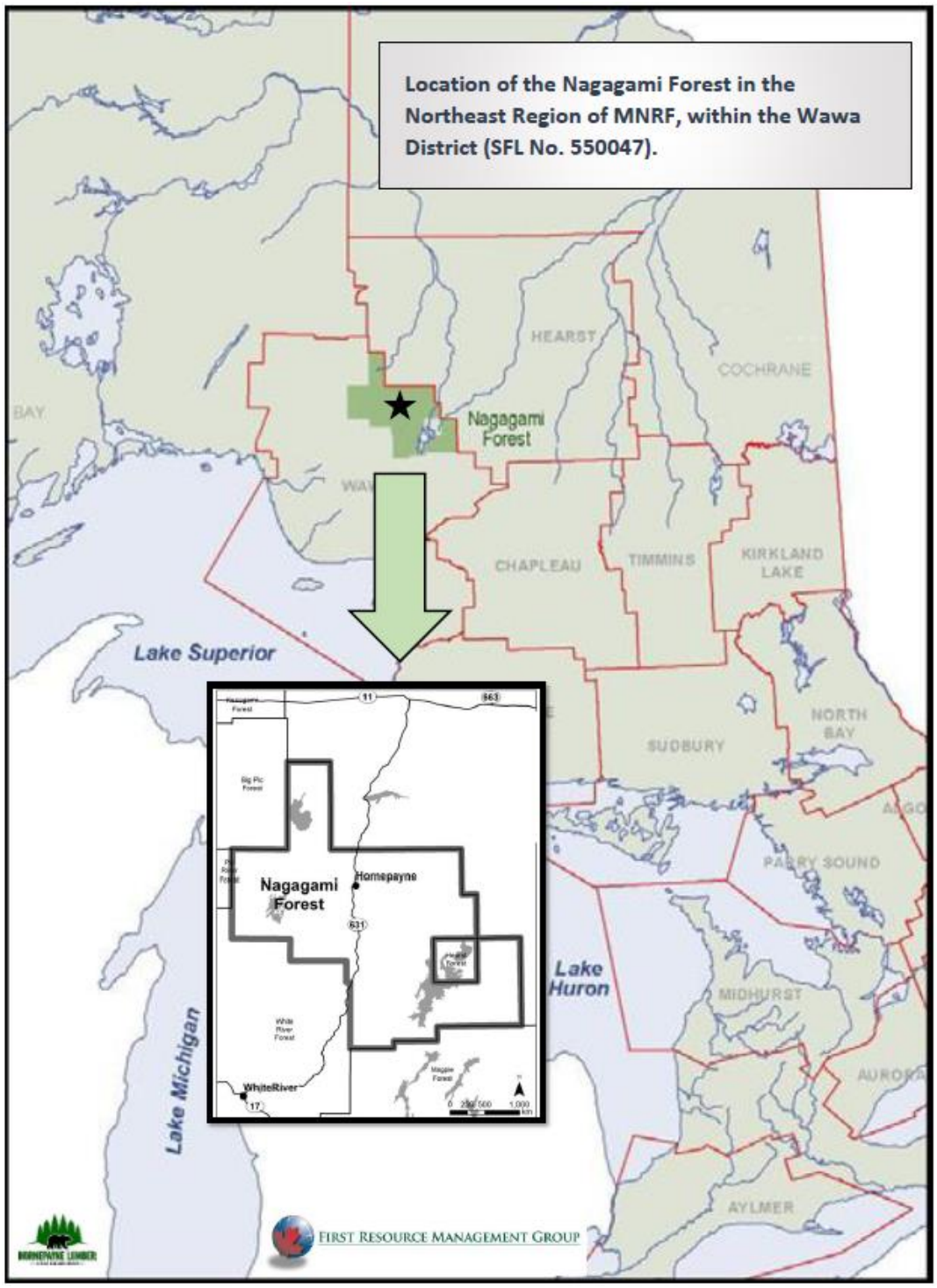


Figure 1. Location of the Nagagami Forest in the context the MNRF Northeast Region.

In Ontario, the MNRF is responsible for the long-term health of Crown forests (public land). This responsibility is shared with forest product companies or groups of companies and communities. The Nagagami Forest was originally held under Crown Timber Licences dated back to June 1956. There were several land base adjustments made up to April 1977. On April 1, 1982, Quebec, and Ontario Paper Company Ltd. (later renamed as QUNO) entered into a Forest Management Agreement (FMA) with the province of Ontario to manage the Nagagami Forest.

On April 1, 1994, the Nagagami Forest was deemed a Sustainable Forest Licence (SFL) under the Crown Forest Sustainability Act. Between March 1996 and March 2004, controlling interest of the SFL changed hands starting with QUNO (which was purchased by Donohue) and then Abitibi Consolidated Inc. in 2000. the licence was transferred to Nagagami Forest Management Ltd. (NFM), a cooperative SFL established in April 2004. In 2008, Jackfish River Management Ltd. (Management Contractor) assumed the administration of the Nagagami Forest on behalf of NFM and most recently in 2019, SFL No. 550047 was transferred to Hornepayne Lumber Limited Partnership for the management of Nagagami Forest. The company is required to carry out all the forest management activities necessary to provide for the sustainability of the Crown Forest on behalf of the Minister, and as specified within the SFL document. First Resource Management Group Inc. (FRMG) is a resource management company that has been retained by Hornepayne Lumber LP to provide forest management services on their behalf. These services include preparing the Nagagami 2021-2031 FMP, as well as annual work schedules and annual reports in accordance with the *Crown Forest Sustainability Act* and the Forest Management Planning Manual. The MNRF provides regulatory direction to the SFL company and ensures conformance to requirements via their review, approval of required documents and subsequent monitoring of implementation activities on the Nagagami Forest.

The content of this plan reflects the collective input from the MNRF, forest industry, the public resource stakeholders, and rights-holders with the objective of ensuring that forest management activities provide social, environmental, and economic benefits while balancing competing needs and maintaining and enhancing forest ecological functions into the future. The Planning Team acknowledges the traditional Indigenous territories of the Anishinabewaki, Cree and Métis, lands on which this Forest Management Plan involves. The James Bay Treaty encompasses the Nagagami Management Unit (MU) extending below the southern border of the forest. As well, the Robinson-Superior Treaty area extends along the western border of Nagagami MU. The Forest Management Planning Manual (FMPM) requires that the MNRF and affected Indigenous communities prepare a Native Background Information Report. The report summarises past resource use and forest management concerns of Indigenous communities and includes values mapping. At their request, Indigenous communities can also take part in a customized consultation process that is tailored to their specific needs and providing additional access, input, and consultation opportunities.

Forest management continues to adapt, evolve and reflect public values, advances in science and technology, and to economic conditions. Ontario's sustainable forest management practices are based on the most up-to-date science and are continuously improved through an adaptive management approach. The FMP is implemented via an approved annual work schedule and results of ongoing activities are presented in a publicly-available annual report.

The 2021-2031 FMP year five annual report will include an assessment, analysis, and review of the implementation of the first five years of the plan. The year five annual report will identify any significant events (e.g., natural disturbances, markets, labour disruptions) that have affected the achievement of objectives in the FMP. The year five annual report will also provide conclusions and recommendations to be addressed in the preparation of the next FMP. This FMP is prepared in consideration of recommendations from the 2011-2021 FMP year five annual report; changes to the forest condition; updates to science and policy; and specific efforts to confirm, update, or revise management objectives and practices (OMNR, 2017).

Section 6.1 (n) of the Supplementary Documentation contains the Terms of Reference which guided the planning team during the preparation of this forest management plan. Section 6.1 (o) of the Supplementary Documentation contains a brief description of how MNRF's Statement of Environmental Values (SEV) under the *Environmental Bill of Rights, 1993*, as amended from time to time, has been considered in the development of the plan in the form of the SEV consideration document. As well, the Index to Endangered Species Act, Section 18 Overall Benefit Instrument Components of the Forest Management Plan is available immediately following the Table of Contents.

The development of this plan has followed a rigorous process as set out in the Forest Management Planning Manual (OMNRF, 2017), which provides direction based on the legislative requirements of the *Crown Forest Sustainability Act (CFSA) and other associated legislation.*

Finally, the Nagagami 2021-2031 FMP has been prepared by a Registered Professional Forester with input from local citizens, Indigenous communities, stakeholders, and the public. The plan author certifies that this FMP provides for the sustainability of the Crown forest.

2.0 MANAGEMENT UNIT DESCRIPTION

2.1 Forest Description

The Nagagami Forest is situated within Northern Ontario's boreal forest which extends from the northern limits of the Great Lakes-St. Lawrence forest to the southern border of the Hudson Bay Lowlands. Coniferous (softwood) and mixed-wood forests dominate the forested section of the Boreal region. The main conifer species are black and white spruce, jack pine, balsam fir, tamarack, and eastern white cedar. The predominant deciduous (hardwood) species are poplar and white birch.

Boreal forests are heavily influenced by natural disturbances. Prior to modern forest fire legislation and technology, large, intense fires burnt across the landscape in relatively frequent intervals leading boreal species to evolve within this environment. As part of their life cycle, boreal species such as jack pine and black spruce adapted and require site disturbance to effectively regenerate. New forests rapidly establish after these disturbances, creating the natural pattern of even-aged forest that contains relatively few species.

2.1.1 Historic Forest Condition

The historic forest information relevant to the description of the pre-industrial forest condition was used when developing the long-term management direction (LTMD) for Nagagami Forest FMP. as it provided insight into the natural dynamics of the forest. The pre-industrial forest is defined as 'the forest that evolved before large-scale harvesting began'. This information provided insight into the natural dynamics of the forest and an indication on how these natural patterns could be emulated with harvesting disturbance. To address the requirement that all Ontario FMP's describe how the current forest condition can be moved towards a more natural historic condition via management intervention, multiple historic disturbance scenarios were modelled and a targeted range of natural variation for selected indicators was apportioned for each forest to contribute to the overall landscape condition. This direction was incorporated into the "Forest Management Guide for Boreal Landscapes" and is the basis for much of the strategic direction developed for this FMP. The quality of the available information determines the reliability of estimates of the average historical condition, which in turn determined its influence on LTMD goal setting. The summary of the historic forest condition for the Nagagami Forest is in section 6.1 (a) of the supplementary documentation.

2.1.2 Current Forest Condition

The current forest condition is derived from the planning inventory. The 2021-31 FMP planning inventory is developed from the enhanced Forest Resource Inventory (eFRI), reflecting the most recent forest management activities and natural disturbances that have occurred on the Nagagami Forest. The planning inventory also contains projected changes, based on the anticipated harvest for the remainder of the current FMP period (i.e. up to March 31, 2021. In the development of the long-term management direction, the current forest condition provides context for the identification of the desired forest and benefits, and the establishment of management objectives and indicators. Through strategic analysis, the LTMD will identify the levels of access, harvest, renewal and tending activities that will balance the achievement of management objectives.

The Crown forest portion of the Nagagami Forest MU provides the base for all decision-making in the FMP. In forest management planning, the Crown forest is categorized as areas available for forest management and other areas. Other areas include national/provincial parks, conservation reserves, and areas that have been designated through legal, policy, or other land use planning decisions, as unavailable for forest management. Further classification of non-forested and forested, as well as non-productive, productive and production forest describes the Crown forest that is available for forest management activities. A summary of the land types for the management unit are provided in FMP-1, which summarizes the status of the Crown land (and the Patent land that contains Crown-reserved forest) at the beginning of this 10-year plan. Currently, the Nagagami Forest encompasses a total area of 441, 948 hectares of Crown land, 8, 055 ha of which occurs within protection forest, parks, and or conservation areas and 625 ha within Crown Land '*other*. Patented land ownership areas where some, or all the forest is reserved to the Crown (i.e. FMP-1 "Patent Crown Timber") comprises 596 Hectares of the total landbase. 399, 030 hectares is managed forested land and 43, 572 hectares is classified as non-forested. Non forested and patent land non timber did not present any significant strategic planning considerations.

Documentation relating to development of the planning inventory, the Base Model Inventory, the Base Model, and the Scoping Analysis can be found in the analysis package (Section 6.1(b) of the Supplementary Documentation).

The orientation of relatively small patent land areas within the MU boundary is not a significant barrier to forest management activities. However, there are some logistical challenges associated with a very large patent land parcel which encompasses the entirety of Derry Township. This township captures the northeast portion of Kabinakagami (Kaby) Lake and is completely surrounded by the Nagagami FMU in all cardinal directions (see Figure 2 for spatial reference). This parcel is privately owned and managed by Wagner Forest Management Limited, thus the roads occurring withing this parcel and are mostly access restricted and can impact planned forest operations within the Nagagami Forest. This has the potential to cause access limitations or to leave these roads functionally unavailable to logging traffic (particularly in the Eastern portion of Woolrich township).

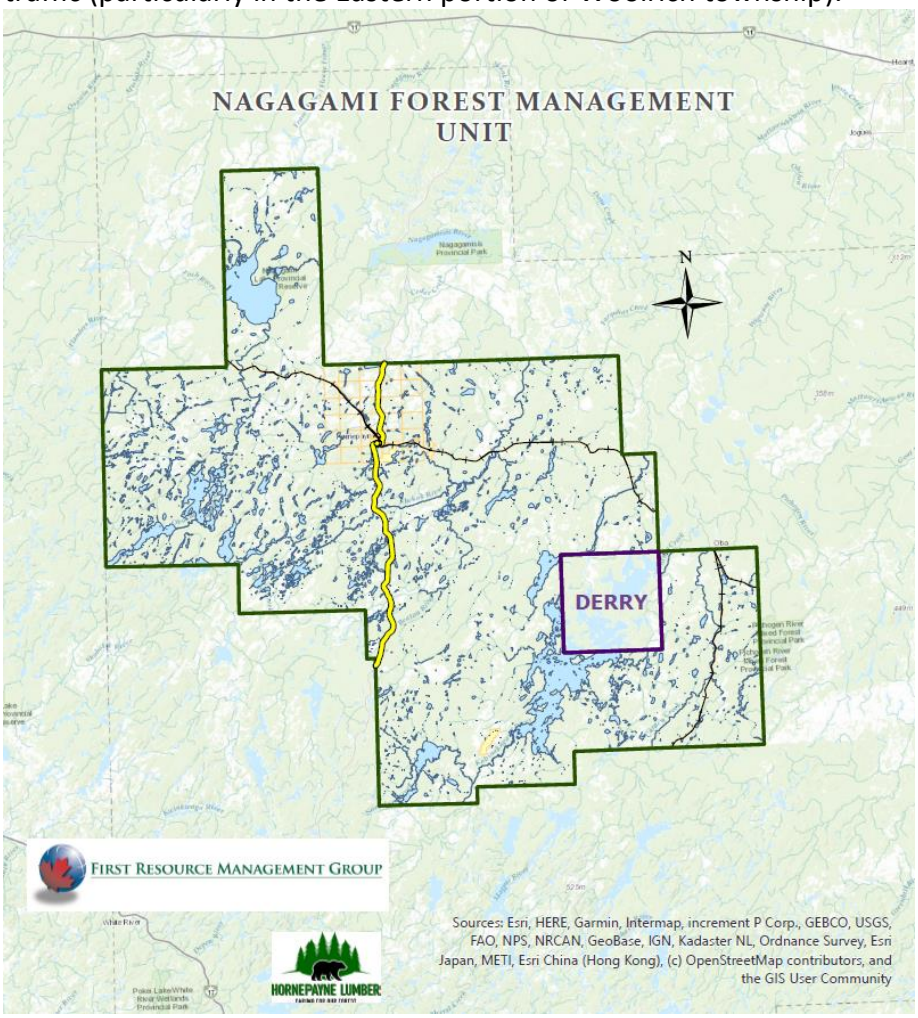


Figure 2. Location of Derry Township (Private, owned by Wagner Forest Management)

Several logistical challenges are associated with avoiding this township when planning and constructing access to harvest operations on Crown land. Long haul distances via Haken Lake road to Mosambik road is the only way to access the south east portion of the forest. The alternative would be to route haul traffic through the Hearst forest to ON-Highway 11 and then south on ON-Highway 631 to the

Hornepayne sawmill. Mosambik road was constructed to link Haken Lake road and Poulin's road, thus providing an economically viable hauling option for wood harvested in the southeast corner of the management unit.

In addition to patent land, several remote tourism operators are present in the Nagagami forest. The Crown Land Use Policy Atlas in conjunction with the Wawa District Crown Land Use Atlas Harmonization Project Management Guidelines (2015) have created additional access planning and road-use measures to protect the perception of remoteness in specific areas. Harvest operations adjacent to identified remote tourism lakes must maintain a forested appearance from the lake. Areas visible from the designated lakes were identified using viewscape analysis and this process is described in detail in the analysis package. The area identified as visible from the remote tourism lakes in the viewscape analysis covers 5% of the total land base. In addition, all-season roads are not permitted within 400 meters of main base lodges and 300 meters of outpost lakes, leaving some areas of the forest potentially inaccessible (i.e. landlocked). Additionally, and depending on the forest type, viewshed areas around remote tourism lakes can be challenging, and in some cases not possible to harvest while maintaining a forested appearance. This dynamic can lead to challenges related to meeting forest cover diversity management objectives.

2.1.3 Forest Classification

2.1.3.1 Forest Units and Analysis Units

A Forest Unit is a classification system that aggregates forest areas for management purposes that will normally have similar species compositions, will develop in a similar manner and that are managed with a under the same silvicultural system. Forest units used in the plan (PLANFU), as described in Table FMP-2, are the primary method of managing forest composition through time and are the basis for many sustainability calculations, harvest allocations and describing forest succession. The PLANFU also link to other forest descriptors such as landscape classes and regional standard forest units in order to develop and track indicators of biodiversity at the landscape and site scales in accordance with the Forest Management Guide for Boreal Landscapes (2014) and the Forest Management Guide for Conserving Biodiversity and the Stand and Site Scales (2010).

Planning forest units are subject to refinement with each FMP. The largest change in forest units for the 2021-31 FMP is the amalgamation of the previous SB1-SB3 and PO1-PO3 forest units (refer to section 4.6.1 of the Analysis Package for further details). The relationship between PLANFUs and regional SFUs and analysis units is presented in section 3.2.3 of the Analysis Package (6.1(b) Supplementary Documentation). Another change from the 2011-21 FMP is that the BOG forest unit is no longer used. Since this previous PLANFU was limited to site class 4, (unmanageable) protection forest, removing this forest unit did not have a material impact in the 2021 FMP.

The other significant change from the 2011 FMP was the inclusion of ecosite information contained in the eFRI in the PLANFU SQL. This change was intended to capitalize on the increased resolution of the new inventory data set and increase the accuracy of FU classification in the planning inventory.

Inclusion of ecosite information changed the definition of each forest unit slightly however, the application and intent of each PLANFU forest unit remains relatively consistent to the 2011 plan except for the BOG, SB3, and PO3 forest units.

A summary of the managed Crown productive forest land area by forest unit and age class has been provided in Table FMP-3. The production forest has been separated into areas available and unavailable for forest management. At plan start, the total unavailable production forest consists of 22, 199.1 ha with 1, 223 ha comprised of islands that are inaccessible by conventional means and therefore not functionally available for timber production. Much of the remainder of area unavailable for timber production is tied up in AOC reserves.

The age class structure of the initial landbase is predominantly fire origin and weighted heavily in the older age classes (i.e. 95 years+), and therefore has the potential to influence significant variation in harvest volumes over the planning horizon. In the interest of providing a more stable and sustainable fibre supply over the planning horizon, the sustainable forest management model was constrained to mitigate dramatic increases/decreases between ten year planning terms. Refer to table 66 in Section 6.4 of the Analysis Package (6.1(b) supplementary Documentation) for additional details.

2.1.3.2 Forest Landscape Classes

The forest landscape is classified in many ways to address various forest management requirements for analysis, reporting, and policy implementation. The landscape classes represent a stratification of forest units by development stage which contribute to similar habitat types. The Forest Management Guide for Boreal Landscapes (2014) provided the direct for stratifying the Base Model Inventory into landscape classes. The relationship between landscape classes and forest units is documented in section 3.6.1 of the analysis package (6.1(b) Supplementary Documentation).

The plan-start conditions for each of the landscape classes have significant implications in the development of the FMP. Landscape classes are highest in the hierarchy of biodiversity objective achievement (i.e. movement towards the desired levels is a high priority) in accordance with the direction in the Landscape Guide. Harvest and renewal levels that are prescribed in the LTMD are, therefore, highly dependent on addressing the desired levels for the landscape class indicators. The distribution of landscape classes at plan start is shown on the landscape pattern map (MU390_2021_FMPDP_MAP_LandPat_00.pdf section 6.1.(u) Supplementary Documentation).

Addressing landscape class target levels represents significant constraints when introduced into the model. Under-represented landscape classes can result in the model reducing harvest levels in associated forest units so that current, or future landscape class area targets are achieved. Conversely, for landscape classes that are over-represented when compared to the targets, higher harvest levels in targeted forest units can result. The model will seek to find an optimal solution meet the desired levels within the planning horizon milestones.

For a full discussion of how the Landscape Guide indicators have been incorporated into the FMP, see Section 3.5 of the Analysis Package. The Landscape Guide driven management objectives and indicators are listed in Table FMP-11.

The Landscape Guide provides direction on the desirable levels for each landscape indicator. These desirable levels are derived at the ecoregional level using the Boreal Forest Landscape Disturbance Simulator (BFOLDS) tool which outputs a (simulated) range of natural variation (SRNV) which is then apportioned by management unit. For non-spatial indicators (i.e. composition and structure), the desirable levels represent the inter-quartile range (IQR) of the SRNV. The IQR represents the middle 50 percent of SRNV values, which falls between the lower (25th percentile) and upper (75th percentile) quartiles.

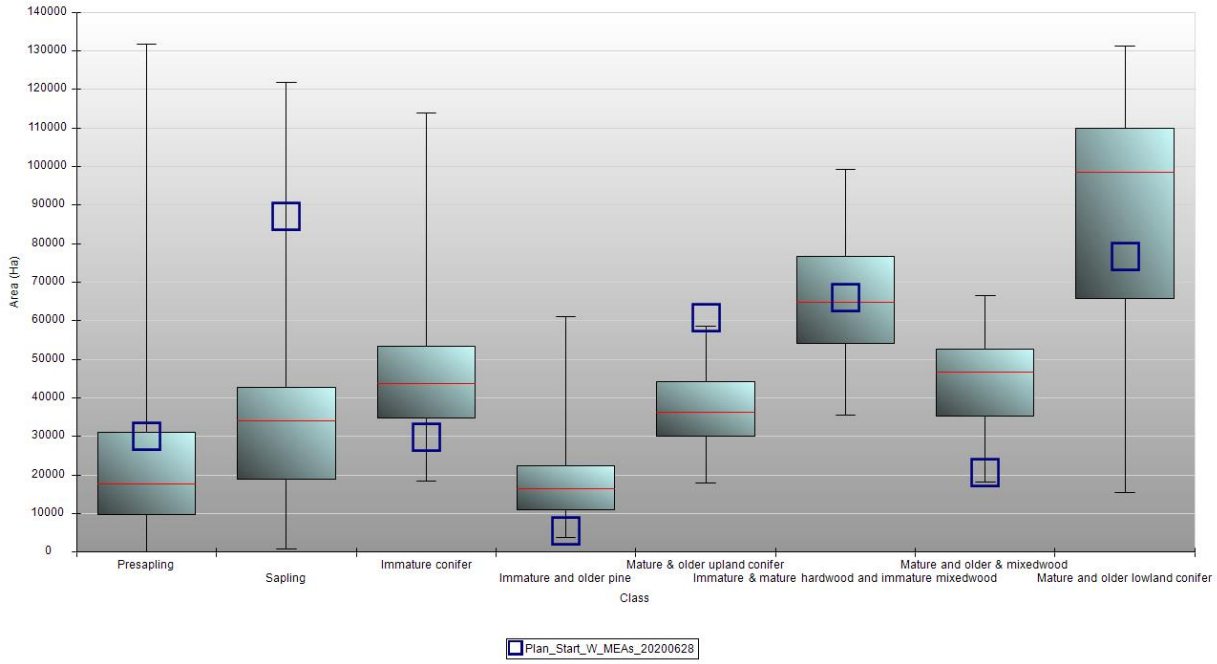


Figure 3, plan start levels across all landscape classes.

The most significant challenge is for the mature and older mixedwood landscape class where the current level of mature and old forest will requires a balance between desirable harvest levels and increasing mature and old forest over time. This is also the case for immature and older pine (IOP), however there is a sizable amount of immature area projected to contribute to this indicator in the near future, which provides more flexibility when balancing between desired harvest levels and landscape class achievement over the planning horizon.

2.1.3.3 Other Forest Classifications

As per current direction from the Forest Management Guide for Boreal Landscapes, wildlife habitat is assessed and tracked using Landscape Guide Indicators, with the associated milestones that provide direction for achievement throughout time (refer to FMP-10). Caribou objectives required additional

habitat classification for mature conifer and winter suitable forest within the portion of the forest that intersects with the Continuous caribou range (refer to section 3.8 of the Analysis Package) for further detail regarding caribou habitat classification.

In addition to the standard interpretations of previous inventories, the entire land base is now also classified by ecological land classification (ELC) eco-site typing at the interpretation stage. Previous inventories were assigned an eco-site based on the previous regional Forest Ecosystem Classification (FEC) systems. This past assignment was based on tree species composition and site class. The new provincial ELC is determined during the inventory production based on interpreted soil conditions and vegetation, as calibrated from ground-based plots. The end results provide a stand-level description of site types that can be used for broader purposes than just traditional forest units.

2.1.4 Forest Resources

In addition to the eFRI, there are other inventories (species at risk, fish, and wildlife), natural resource features, land uses and values that provided valuable background information during the development of the Nagagami FMP.

2.1.4.1 Inventories and Information for Species at Risk

A Species at Risk (SAR) is any naturally occurring plant or animal that has been listed as either a Species of Special Concern, Threatened, Endangered or Extirpated from a defined area (natural range, geopolitical area such as a province or a country). The federal SAR list in Canada is determined based on the recommendations of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). In Ontario, the Committee on the Status of Species at Risk in Ontario (COSSARO) assesses and recommends species for inclusion on the provincial list. The Committee is responsible for making recommendations to the Minister of Environment, Conservation and Parks (MECP) regarding listing or delisting of species or amendments to the SAR list for Ontario. Once a species has been listed, legislation is enacted under the Endangered Species Act to conserve or create habitat for this species. The species' designation gives them priority in the forest management planning process if they are identified in each management unit. MNRF continues to manage SAR under the Crown Forest Sustainability Act (CFSA), and therefore in relation to Forest Management Plans (FMPs).

Species at risk are classified in the following manner:

- ***Extirpated:*** *A native species no longer present in the wild.*
- ***Endangered:*** *A native species threatened with imminent extinction or extirpation in the area.*
- ***Threatened:*** *A native species at risk of becoming endangered if steps are not taken to address threatening it.*
- ***Special Concern:*** *A native species that is not endangered or threatened but may become endangered or threatened due to a combination of biological characteristics and identified threats.*

Endangered and threatened SAR by virtue of their listing through the Endangered Species Act (ESA) are afforded habitat protection. Upon being listed, government must develop a recovery strategy (habitat regulation) identifying steps to protect and restore populations within one year for endangered species and within two years for threatened species. Species-specific habitat regulations that describe an area

to be protected are to be developed one year after that. Management plans are also prepared for special concern species within five years of being listed, outlining the government's ongoing population monitoring as well as future recovery and research goals.

Table FMP-7: Projected Habitat for Selected Wildlife Species predates the current direction regarding wildlife habitat management. Current direction from the *Forest Management Guide for Boreal Landscapes* (Boreal Landscape Guide) indicates that wildlife habitat is assessed and tracked using Landscape Guide Indicators, with the associated milestones that provide direction for achievement throughout time (see FMP-10). In addition, wildlife habitat is assessed and tracked spatially through the use of Area of Concern (AOC) prescriptions (FMP-11 and Section 4.2.1) and Conditions on Regular Operations (Section 4.2.2.2). In this FMP, a variety of approaches are used to provide for SAR. Sites of particularly high value and sensitivity that are known to be occupied by SAR, such as nesting or spawning sites, are managed through AOC prescriptions. Habitat supply is maintained at natural levels by striving in the FMP to ensure all forest types and age classes are represented across the landscape in approximately natural amounts.

MNRF undertakes a variety of surveys to increase knowledge of SAR. SAR presentations are delivered to forest industry workers by the license-holder at each start-up meeting in the spring, and reference material is distributed to increase awareness of SAR, and to encourage reporting of sightings to MNRF. If new species are listed in the regulations of the Ontario ESA during implementation of the 2021 – 2031 Nagagami FMP, and if these species could be affected by forest management activities, or if habitat regulations are developed under the ESA and these regulations would apply, the FMP amendment process will be used, as required, to amend the FMP so that it complies with the law.

Table 1: Species at Risk confirmed or with reasonable potential to occur in Nagagami Forest

Common name	Scientific name	Species at Risk in Ontario status	Confirmed on Nagagami Forest	Area of Concern Prescription
Bald Eagle	Haliaeetus leucocephalus	Special Concern	✓	✓
Common Nighthawk	Chordeiles minor	Special Concern	✓	✓
Eastern Whip-poor-will	Antrostomus vociferous	Threatened	✓	✓
Short-eared Owl	Asio flammeus	Special Concern	✓	✓
Woodland Caribou	Rangifer tarandus Caribou	Threatened	✓	✓
Barn Swallow	Hirundo rustica	Threatened	✓	✗
Black Tern	Chilidonias niger	Special Concern	✓	✗
Canada Warbler	Cardellina canadensis	Special Concern	✓	✗
Eastern Wood-pewee	Contopus virens	Special Concern	✓	✗
Wood Thrush	Hylocichla mustelina	Special Concern	✓	✗
Bank Swallow	Riparia riparia	Threatened	✗	✓

Chimney Swift	Chaetura pelagica	Threatened	✗	✓
Eastern Small-footed Myotis	Myotis leibii	Endangered	✗	✓
Little Brown Myotis	Myotis lucifugus	Endangered	✗	✓
Northern Myotis	Myotis septentrionalis	Endangered	✗	✓
Peregrine Falcon	Falco peregrinus	Special Concern	✗	✓
Cougar	Puma concolor	Endangered	✗	✗
Evening Grosbeak	Coccothraustes vespertinus	Special Concern	✗	✗
Horned Grebe	Podiceps auritus	Special Concern	✗	✗
Lake Sturgeon	Acipenser fulvescens	Special Concern	✗	✗
Monarch Butterfly	Danaus plexippus	Special Concern	✗	✗
Olive-sided Flycatcher	Contopus cooperi	Special Concern	✗	✗
Rusty Blackbird	Euphagus carolinus	Special Concern	✗	✗
Snapping Turtle	Chelydra serpentina	Special Concern	✗	✗
Yellow-banded Bumblebee	Bombus terricola	Special Concern	✗	✗
Yellow Rail	Coturnicops noveboracensis	Special Concern	✗	✗

2.1.4.1.1 Species at Risk with Area of Concern prescriptions confirmed on Nagagami Forest

The habitat of the following SAR known to occur within the Nagagami Forest will be provided or protected using AOC prescriptions identified in FMP-11. These species are described in the sections below (source: SAR in Ontario list).

Bald Eagle (Special Concern)

Bald eagles' nest in a variety of habitats and forest types, almost always near a major lake or river where they do most of their hunting. While fish are their main source of food, bald eagles can easily catch prey up to the size of ducks, and frequently feed on dead animals, including white-tailed deer. They usually nest in large trees such as pine and poplar. During the winter, bald eagles sometimes congregate near open water or in places where carcasses might be found. Bald eagles are widely distributed throughout North America. In Ontario, they nest throughout the north, with the highest density in the northwest near Lake of the Woods. Their largest decline came with the introduction of chlorinated hydrocarbon pesticides such as DDT which bioaccumulated up the food chain, and in the case of top bird predators, resulted in thin eggshells that broke as the adults tended to them in the nest. Although most of these threats have been reduced or eliminated, current bald eagle populations are impacted by the continued development of shoreline habitat and pollution. Typically, bald eagle nests are easily identifiable. They are extra-large nests up to three metres wide located within or below the canopy of live trees, usually large and often super canopy poplars, on the shores of larger lakes. Nests are located during aerial surveys as well as from reports by forest resource users and are documented in the Land Information Ontario (LIO) database. The database currently documents 61

confirmed bald eagle nests on the Nagagami Forest. The AOC prescription can be found in FMP-11 (EAG).

Common Nighthawk (Special Concern)

Traditional common nighthawk habitat consists of open areas with little to no ground vegetation, such as logged or burned-over areas, forest clearings, rock barrens, peat bogs, lakeshores, and mine tailings. Although the species also nests in cultivated fields, orchards, urban parks, mine tailings and along gravel roads and railways, they tend to occupy natural sites. The range of the common nighthawk spans most of North and Central America. In Ontario, the common nighthawk occurs throughout the province except for the coastal regions of James Bay and Hudson Bay. The large-scale use of insecticides within their winter range may be partly responsible for the widespread decline in common nighthawk since insects are their main food source. Habitat degradation resulting from fire suppression, land use changes in the Boreal forest and an increase in intensive agriculture are other contributing factors. The proliferation of terrestrial predators around urban areas, such as domestic cats, striped skunks, racoons, and American crows, have likely caused increased nest predation. Common nighthawk is included in the AOC prescription for Ground-Nesting Raptors (GNR-4).

Eastern Whip-Poor-Will (Threatened)

The Eastern whip-poor-will is usually found in areas with a mix of open and forested areas, such as savannahs, open woodlands, or openings in more mature, deciduous, coniferous and mixed forests. It forages in these open areas and uses forested areas for roosting (resting and sleeping) and nesting. It lays its eggs directly on the forest floor, where its colouring allows then to easily remain undetected by visual predators. Although Eastern whip-poor-wills were once widespread throughout the central Great Lakes region of Ontario, their distribution in this area is now fragmented. There is some uncertainty surrounding the decline of the Eastern whip-poor-will, with the main threat to the species suspected to be habitat loss and degradation. The habitat loss is a result of natural changes when open fields and thickets become closed forest in the north, and intensive agriculture in the south. Additional threats include car mortalities and changes in food supply related to pesticides. The AOC prescription can be found in FMP-11 (EWW).

Short-Eared Owl (Special Concern)

The Short-eared Owl lives in open areas such as grasslands, marshes, and tundra where it nests on the ground and hunts for small mammals, especially voles. In Ontario, the species has a scattered distribution, found along the James Bay and Hudson Bay coastlines, along the Ottawa River in eastern Ontario, in the far west of the Rainy River District, and elsewhere in southern Ontario. Most northern populations are migratory, moving southward in the winter. The Short-eared Owl was probably more common and widespread in southern Ontario when there were larger areas of native prairie and savannah, their preferred habitat. The creation of new grasslands with the clearing of forests for farmland may have initially benefited the species, but as agricultural methods became more intensive with the mowing of fields during the nesting season and overgrazing by livestock, these areas became unsuitable for this owl. Other threats include loss of marshes. The AOC prescription can be found in FMP-11 (GNR-2).

Woodland Caribou (Threatened)

Woodland caribou (Boreal population) habitat in the Boreal forest is constantly changing. Much of the forest is naturally in an unsuitable condition for caribou at any one time, but caribou need and use the entire landscape over time as habitat changes. Disturbances from fires, blowdown, and insects can quickly change the amount and distribution of habitat. There is also great ecological variation in caribou habitat across the province ranging from upland fire-dependent forests in the northwest to extensive lowland forests in the northeast where fire is much less frequent. At the broad landscape scale, caribou require large, undisturbed areas of old or mature conifer upland forest and lowlands dominated by jack pine/black spruce and black spruce respectively. These areas allow caribou to effectively separate themselves from higher densities of moose and white-tailed deer (and the grey wolves and black bears that prey upon them) which tend to be associated with younger mixed or deciduous forest. At smaller scales, caribou seasonally select specific habitat features and areas that support successful reproduction and calf rearing, provide summer and/or winter forage, and/or facilitate movement between discrete areas of use. The Boreal population of caribou was formerly found throughout most of northern Ontario. Its range has now receded, and the species is generally found north of Sioux Lookout, Geraldton, and Cochrane with a few isolated populations further south along the shoreline and islands of Lake Superior. The northern portion of the Nagagami Forest is intersected by the *Pagwachuan Caribou Range*. The western portion of the Nagagami Forest is intersected by the *Discontinuous Caribou Range*. Threats to the Boreal population of caribou include habitat loss, degradation, and fragmentation due to human settlement and development activities such as forestry, mining, hydro corridors, and roads. Caribou are also at risk from an increase in predation and disease that accompanies such broad habitat changes. Between 40 to 50 per cent of caribou range in Ontario has been lost since the late 1800s. Climate change has the potential to affect the Boreal population of caribou by further reducing available habitat and influencing food sources. These changes could also create conditions that are more suitable for moose and deer and as a result increase the number of predators that these species attract. AOC prescriptions for Caribou Calving and Nursery Areas that are in suitable condition (CALV) and Caribou Winter Use Areas (CWA) are found in FMP-11.

The habitat uses and behavioural patterns of the caribou in Ontario make it difficult to manage for this species using the coarse filter habitat approach or using observation-driven AOC. The management of caribou habitat is conducted at a range scale based on recommendations within the Government Response Statement known as the Caribou Conservation Plan, and subsequent policies including the Range Management Policy in Support of Woodland Caribou Conservation and Recovery. Habitat use and management of the northern caribou ranges is relatively prescriptive with a policy direction to manage for the quality, quantity, and location of caribou habitat across the landscape and through time. The management intent for the discontinuous range is less prescriptive and falls under different policy direction than the northern continuous range. Instead of managing for quality, quantity and location of caribou habitat in these areas, the coastal area is focused on managing for population security, persistence, and connectivity; while the discontinuous management intent is focused on improving connectivity between the northern range and the Lake Superior coastal range. Within this forest management plan, the intent of the Caribou Conservation Plan and Range Management Policy have been delivered through the application of the Boreal Landscape Guide which provides both landscape scale and stand and site level direction for managing caribou habitat.

2.1.4.1.2 Species at Risk without Area of Concern prescriptions confirmed on Nagagami Forest

The other provincially listed species at risk known to occur on the Nagagami Forest are described in the sections below (source: SAR in Ontario list). Special Concern species do not receive species or habitat protection under the Endangered Species Act and thus do not have AOC prescriptions. Habitat for SAR will be provided through the following mechanisms:

- In some areas, a coarse filter landscape approach will be used, to maintain natural amounts of area within the appropriate landscape classes (e.g., mature, and older conifer).
- The Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (Stand and Site Guide) direction and guidelines for protecting flowing waters, rivers and streams are applied to all permanent rivers and streams.
- The Stand and Site Guide enables some harvesting to shore under appropriate conditions, which also provides habitat for certain species.
- Wildlife trees are retained where appropriate within harvest blocks as per Stand and Site Guide direction.
- Conditions on Regular Operations (Section 4.2.2.2) also provide habitat protection, including minimizing impacts to wetland habitats.
- Forest industry workers receive SAR awareness training and are encouraged to report sightings.

Barn Swallow (Threatened)

Barn swallows often live in close association with humans, building their cup-shaped mud nests almost exclusively on human-made structures such as open barns, under bridges and in culverts. The species is attracted to open structures that include ledges where they can build their nests, which are often re-used from year to year. They prefer unpainted, rough-cut wood since the mud does not adhere as well to smooth surfaces. The barn swallow may be found throughout southern Ontario and can range as far north as Hudson Bay, wherever suitable locations for nests exist. barn swallows have experienced a significant decline since the mid-1980s. While there have been losses in the number of available nest sites, such as open barns, and in the amount of foraging habitat in open agricultural areas, the causes of the recent population decline are not well understood.

Black Tern (Special Concern)

Black terns build floating nests in loose colonies in shallow marshes, especially in cattails. In Ontario, black terns are found scattered throughout the province, but breed mainly in the marshes along the edges of the Great Lakes. Historical records show black terns were once common in Ontario, and that recent declines have been occurring since the 1980s. Threats include the draining and altering of wetlands, water pollution and human disturbance at nesting colonies – especially boat traffic, which can swamp the terns' floating nests. Riparian zones and wetlands that may be used by the birds are protected through the application of riparian and water quality reserves as per the Stand and Site Guide.

Canada Warbler (Special Concern)

The Canada warbler breeds in a range of deciduous and coniferous, usually wet forest types, all with a well- developed, dense shrub layer. Dense shrub and understory vegetation help conceal Canada warbler nests that are usually located on or near the ground on mossy logs or roots, along stream

banks or on hummocks. The Canada warbler only breeds in North America and 80 per cent of its known breeding range is in Canada. Its primary breeding range is in the Boreal Shield, extending north into the Hudson Plains and south into the Mixedwood Plains. Although the Canada warbler breeds at low densities across its range, in Ontario, it is most abundant along the Southern Shield. A reduction in forests with a well-developed shrub-layer has likely impacted Canada warblers throughout their breeding range. Canada warblers likely face extensive pressure on their wintering grounds in South America, where deforestation is a widespread problem.

Eastern Wood-Pewee (Special Concern)

The eastern wood-pewee lives in the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It is most abundant in intermediate-age mature forest stands with little understory vegetation. The eastern wood-pewee is found across most of southern and central Ontario, and in northern Ontario as far north as Red Lake, Lake Nipigon, and Timmins. Possible threats to the eastern wood-pewee are poorly known but may include: loss and degrading of habitat due to urban development and/or changes in how forests are managed; reductions in the availability of the flying insects they eat, the cause of which is not known; and loss of eggs and fledgling birds from increasing numbers of predators such as blue jays and red squirrels. These birds may also face other threats during their migration and in their wintering habitat in South America.

Wood Thrush (Special Concern)

The wood thrush lives in mature deciduous and mixed (conifer-deciduous) forests. They seek moist stands of trees with well-developed undergrowth and tall trees for singing perches. These birds prefer large forests but will also use smaller stands of trees. They build their nests in living saplings, trees, or shrubs, usually in sugar maple or American beech. There is a very small population near Lake of the Woods in northwestern Ontario, and there have been scattered sightings in the mixed forest of northern Ontario. Major threats to the wood thrush appear to be: the loss or breaking up of the bird's forest habitat from urban, suburban and cottage development; and parasitic behaviour from brown-headed cowbirds, which lay their eggs in the nests of the wood thrush (and other birds), and whose young are fed by the host thrush at the expense of their own young. Loss and the breaking up of forests in the bird's winter habitat may also be a threat to the wood thrush.

2.1.4.1.3 Species at Risk with Area of Concern prescriptions and with potential to occur on the Nagagami Forest

Other species at risk with reasonable potential to occur on the Nagagami Forest are described in the sections below (source: SAR in Ontario list). These species have AOC prescriptions.

Bank Swallow (Threatened)

Bank swallows' nest in burrows in natural and human-made settings where there are vertical faces in silt and sand deposits. Many nests are on banks of rivers and lakes, but they are also found in active sand and gravel pits or former ones where the banks remain suitable. The birds breed in colonies ranging from several to a few thousand pairs. The bank swallow is found across southern Ontario, with sparser populations scattered across northern Ontario. Although still widespread in Ontario, the bank swallow has declined in numbers and locations where it is found in the province. Several factors taken together are believed to threaten the bank swallow. These include loss of breeding and foraging

habitat, destruction of nesting habitat, widespread pesticide use (that has reduced the populations of insects they eat), impacts of climate change and collision with vehicles. Although activities at sand and gravel pits may contribute to the loss of some nests, the fact that many bank swallow colonies in Ontario are in sand and gravel pits suggests they also provide important nesting habitat. The AOC prescription can be found in FMP-11 (BSC).

Chimney Swift (Threatened)

Before European settlement chimney swifts mainly nested on cave walls and in hollow trees or tree cavities in old growth forests. Today, they are more likely to be found in and around urban settlements where they nest and roost (rest or sleep) in chimneys and other built structures. They also tend to stay close to water as this is where the flying insects they eat congregate. In Ontario, it is most widely distributed in the Carolinian zone in the south and southwest of the province but has been detected throughout most of the province south of the 49th parallel. Historically, chimney swifts were likely sparse across their range and probably limited by suitable nesting sites (e.g., tree cavities and caves). Following European settlement, their numbers increased substantially as they began using chimneys as nest sites. The primary causes of the current chimney swift population decline are unknown, but are likely related to declines in their prey, flying insects. Chimney swifts are one of many bird species that feed on flying insects and are declining. Chimney swifts face the added pressure of habitat loss resulting from the modernization of chimneys (capped, round, metal flues) that prohibits the swifts from entering potential nest sites. Chimney Swift is included in the AOC prescription for Nesting Raptors in FMP-11 (NR-8).

Eastern Small-footed Myotis (Endangered)

Eastern small-footed myotis is the smallest bat and one of the rarest bats in eastern North America. In the spring and summer, eastern small-footed bats will roost in a variety of habitats, including in or under rocks, in rock outcrops, in buildings, under bridges, or in caves, mines, or hollow trees. These bats often change their roosting locations every day. At night, they hunt for insects to eat, including beetles, mosquitos, moths, and flies. In the winter, these bats hibernate, most often in caves and abandoned mines. They seem to choose colder and drier sites than similar bats and will return to the same spot each year.

Eastern small-footed myotis is threatened by white nose syndrome, which is caused by a fungus believed to have been inadvertently brought from Europe to North America. The fungus grows in humid, cold environments, such as the caves and mines where many bats hibernate. The syndrome disrupts the hibernation cycle, so that bats use up body fat supplies before the spring when they can once again find food sources. It is also thought that the fungus affects the wing membrane, which helps to maintain water balance in bats. Thirst may wake bats from hibernation, which may be why infected animals can be seen flying outside caves and mines during the winter.

In Ontario, bat populations dropped by more than 90% in eight hibernation sites with more than two years' exposure to white nose syndrome. Bats at more than three quarters of Ontario's hibernation sites are at high risk of disappearing due to white nose syndrome. Mass die-offs mean that there are no individuals left to reproduce. Eastern small-footed myotis may be less susceptible to this syndrome

than other species, since they tend to hibernate in the cooler, drier part of the cave where the fungus may be less virulent. The AOC prescription can be found in FMP-11 (BAT).

Little Brown Myotis (Endangered)

Bats are nocturnal. During the day they roost in trees and buildings. They often select attics, abandoned buildings and barns for summer colonies where they can raise their young. Bats can squeeze through very tiny spaces (as small as six millimetres across) and this is how they access many roosting areas. Little brown myotis hibernate from October or November to March or April, most often in caves or abandoned mines that are humid and remain above freezing. The little brown myotis is widespread in southern Ontario and found as far north as Moose Factory and Favourable Lake. Little brown bats are threatened by a disease known as white nose syndrome, caused by a fungus which is believed to have been inadvertently brought from Europe to North America. The AOC prescription can be found in FMP-11 (BAT).

Northern Myotis (Endangered)

Northern myotis, also known as northern long-eared bats, are associated with Boreal forests, choosing to roost under loose bark and in the cavities of trees. These bats hibernate from October or November to March or April, most often in caves or abandoned mines. The northern myotis is found throughout forested areas in southern Ontario, to the north shore of Lake Superior and occasionally as far north as Moosonee, and west to Lake Nipigon. Northern myotis are threatened by a disease known as white nose syndrome, caused by a fungus which is believed to have been inadvertently brought from Europe to North America. The AOC prescription can be found in FMP-11 (BAT).

Peregrine Falcon (Special Concern)

Peregrine falcons usually nest on tall, steep cliff ledges close to large bodies of water. This species is widely distributed, found on every continent, except Antarctica. The historic North American distribution of the eastern subspecies is east of the Rocky Mountains and south of the tree line. Although peregrine falcons now nest in and around Toronto and several other southern Ontario cities, most Ontario's breeding population is found around Lake Superior in northwestern Ontario. In the 1950s, peregrine numbers began to drop, and by the mid 1960s, the falcon had disappeared from Ontario. Eventually, it was discovered that the pesticide DDT was responsible for the birds' decline. The very real possibility of the birds' extinction caused worldwide concern and led to major recovery efforts across North America. The peregrine falcon came to symbolize the plight of many species threatened by pollution. Today, the peregrine falcon faces many of the same threats facing other species at risk: habitat loss and destruction, disturbance and persecution by people, and environmental contaminants. The AOC prescription can be found in FMP-11 (PER).

2.1.4.1.4 Species at Risk without Area of Concern prescriptions and with potential to occur on the Nagagami Forest

The following species have some potential to be present on the Nagagami Forest. Given that their range extends into the area, they could be encountered. AOC prescriptions have not been developed for these species. They are described in the sections below (source: SAR in Ontario list).

Cougar (Endangered)

The cougar lives in large, undisturbed forests or other natural areas where there is little human activity. The forest must support plenty of white-tailed deer or moose. The species has a very wide range, encompassing large areas of North, Central and South America. In Ontario, cougars are most likely believed to live in northern Ontario because of the remoteness of the habitat. However, there have been many reports from the southern part of the province. Cougars found in Ontario may be escaped or released pets, animals dispersing from western North America, native animals, or a combination of those factors. The population size is unknown. The main threat to the cougar is human disturbance and forest clearing, which destroys habitat and can reduce the prey necessary for the survival of this species.

Evening Grosbeak (Special Concern)

During the breeding season, the evening grosbeak is generally found in open, mature mixed-wood forests dominated by fir species, white spruce, and/or trembling aspen. Its abundance is strongly linked to the cycle of its primary prey, the spruce budworm. Outside the breeding season, the species depends mostly on seed crops from tree species in the Boreal forest such as firs and spruces. It is also attracted to ornamental trees that have seeds or fruit and may visit bird feeders. In Ontario, it breeds in coniferous forests across northern Ontario, as far south as southern Georgian Bay. Potential threats to the evening grosbeak include habitat loss and degradation from forestry practices, chemical measures to control spruce budworm populations and climate change impacts. Collisions with vehicles while flying over roads or ingesting salt along roadsides and hitting windows near bird feeders have also been identified as threats. It is thought that the decline in populations since the 1970s is correlated with the 25 to 40-year natural cycle of the spruce budworm.

Horned Grebe (Special Concern)

Horned grebe usually nests in small ponds, marshes and shallow bays that contain areas of open water and emergent vegetation. Nests are usually located within a few metres of open water. This vegetation provides adults with nest materials, concealment, and protection for their young. The horned grebe occupies natural habitat more often than man-made reservoirs and artificial ponds. The horned grebe is a rare breeder in Ontario. Following the breeding season, most individuals migrate from inland freshwater nesting sites to coastal marine sites, although some individuals overwinter on large bodies of freshwater. It is not known why the horned grebe is declining across North America. It is expected that populations are threatened by the permanent loss of wetlands to agriculture and development. Widespread and recurring droughts across the prairies have also resulted in loss of wetlands.

Lake Sturgeon (Special Concern)

Lake sturgeon (Southern Hudson Bay - James Bay populations) lives almost exclusively in freshwater lakes and rivers with soft bottoms of mud, sand, or gravel. They are usually found at depths of five to 20 metres. They spawn in relatively shallow, fast-flowing water (usually below waterfalls, rapids, or dams) with gravel and boulders at the bottom. However, they will spawn in deeper water where habitat is available. They also are known to spawn on open shoals in large rivers with strong currents. In North America, lake sturgeon can be found from Alberta to the St. Lawrence drainage of Quebec and from the southern Hudson Bay to the lower Mississippi. In Ontario, the lake sturgeon is found in the

rivers of the Hudson Bay basin, the Great Lakes basin, and their major connecting waterways, including the St. Lawrence River. Historically, harvesting, dams and other river barriers, habitat loss, and poor water quality were responsible for the decline of Lake Sturgeon throughout North America. With improvements in water quality and the strict regulation or elimination of commercial and recreational fishing of lake sturgeon in Ontario, habitat fragmentation and regulated water flows from dams are the greatest threats to the species.

Monarch butterfly (Special Concern)

Monarch butterfly can be found in Ontario wherever there are milkweed plants for its caterpillars and wildflowers for a nectar source. Throughout their life cycle, Monarchs use three different types of habitat. Only the caterpillars feed on milkweed plants and are confined to meadows and open areas where milkweed grows. Adult butterflies can be found in more diverse habitats where they feed on nectar from a variety of wildflowers. Monarchs spend the winter in Oyamel Fir forests found in central Mexico. The largest threat to Ontario Monarchs is habitat loss and fragmentation at overwintering sites in central Mexico where forests are being logged and converted into agricultural fields and pastures. Widespread pesticide and herbicide use throughout the Monarch's range may also limit recovery.

Olive-sided Flycatcher (Special Concern)

The olive-sided flycatcher is most often found along natural forest edges and openings. It will use forests that have been logged or burned if there are ample tall snags and trees to use for foraging perches. Olive-sided flycatchers' breeding habitat usually consists of coniferous or mixed forest adjacent to rivers or wetlands. In Ontario, olive-sided flycatchers commonly nest in conifers such as white and black spruce, jack pine and balsam fir. The olive-sided flycatcher has a broad breeding range across Canada and the western and northeastern United States. In Ontario, it is widely distributed throughout the central and northern areas of the province. The cause of olive-sided flycatcher decline is unclear. Likely threats to the species include habitat loss and alteration of both breeding and wintering grounds. There is some evidence to suggest that individuals breeding in managed forests have lower nest success compared to those breeding in natural forest stands. Olive-sided flycatchers may also be declining because of declining insect prey.

Rusty Blackbird (Special Concern)

The rusty blackbird breeds in habitats that are dominated by coniferous forest with wetlands nearby including bogs, marshes, and beaver ponds. During the winter, it is found in wet woodlands, swamps, and pond edges and often forages in agricultural lands. The rusty blackbird is only found in North America. In Ontario, the breeding range is found in the Hudson Bay Lowlands and northern Boreal Shield ecozones. Approximately 86 percent of the global population breeds in Canada. Most threats that impact on the rusty blackbird are within their stopover and wintering habitats. The conversion of wetland forests in its wintering habitat in the United States for residential development and agriculture is one of the most significant threats to the species. Other factors include changes in surface hydrology through dam development, blackbird control programs and mortality from pesticides. Threats to its breeding habitat in Ontario include the negative impacts of climate change and industrial landscape-level activities on forest and wetland habitats.

Snapping Turtle (Special Concern)

Snapping turtles spend most of their lives in water. They prefer shallow waters so they can hide under the soft mud and leaf litter, with only their noses exposed to the surface to breathe. During the nesting season, from early to mid summer, females travel overland in search of a suitable nesting site, usually gravelly or sandy areas along streams. Snapping turtles often take advantage of built structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits. It takes 15 to 20 years for a snapping turtle to reach maturity. As a result, adult mortality greatly affects the species' survival. During the summer, many turtles cross roads in search of mates, food, and nest sites. This is risky for turtles as they are too slow to get out of the way of moving vehicles. Snapping turtles are also sometimes intentionally persecuted. Eggs in nests around urban and agricultural areas are subject to predators such as raccoons and striped skunks.

Yellow-banded Bumblebee (Special Concern)

Yellow-banded bumblebee is a forage and habitat generalist, able to use a variety of nectaring plants and environmental conditions. The yellow-banded bumblebee has a large range throughout much of Canada and parts of the United States. It can be found in mixed woodlands, particularly for nesting and overwintering, as well as a variety of open habitat such as native grasslands, farmlands, and urban areas. Nest sites are often underground in abandoned rodent burrows or decomposing logs. The yellow-banded bumblebee ranges from the Mixedwood Plains of southern Ontario to the Hudson Bay Lowlands in the north. In southern Ontario, it is still observed but is less common than it was historically after steep declines. Less is known about historical or recent abundance of yellow-banded bumblebee in the northern portion of its range. Causes of decline of this once common species are only partially understood. Suspected threats to the yellow-banded bumblebee include a combination of factors such as the introduction of pathogens from managed bee colonies, pesticide use, climate change, and habitat loss.

Yellow Rail (Special Concern)

Yellow rails are secretive birds and live deep in the reeds, sedges, and marshes of shallow wetlands, where they nest on the ground. The marshy areas used by yellow rails have an overlying dry mat of dead vegetation that is used to make roofs for nests. The yellow rail ranges across much of central Canada and parts of the northern United States. In Ontario, it is mainly found in the Hudson Bay Lowlands region and is only found in localized marshes in southern Ontario. The breeding status of yellow rail in Boreal regions south of the Hudson Bay Lowlands is uncertain. It winters along the southeastern coast of the United States and the Gulf of Mexico. Yellow rail populations declined in southern Ontario due to habitat loss, as wetlands were drained for urban development and agriculture. Expanding snow goose populations in the Hudson Bay Lowlands may also be destroying habitat through localized grazing. The yellow rail has not benefited from wetlands restoration for waterfowl, as it prefers shallow marshes rather than open waters. Invasive, non-native plants are also a threat since they change the vegetation composition of wetlands and marshlands making the habitat less suitable for yellow rail.

2.1.4.2 Fish and Wildlife Inventories

The Nagagami Forest covers a large geographic area and is endowed with a rich abundance of natural resources. This natural wealth provides valuable ecological services to the region as well as recreational and other opportunities that attract a variety of users who derive benefits from resources that are directly or indirectly dependent on forest cover. Three Wildlife Management Units intersect the forest: 21B, 22, 32.

The MNRF undertakes field monitoring of many fish and wildlife species and their habitat. Data is used for many purposes including the allocation of fish and wildlife for consumptive use and the monitoring of relative change in wildlife populations in a variety of habitats over time. In addition, specific wildlife values including nests and moose aquatic feeding areas, which are monitored as part of the forest management planning process to identify these features on the landscape.

Fish and wildlife habitat on the Nagagami Forest is managed through forest management activities that manipulate forest cover using an ecosystem approach (coarse filter) and through the protection of special or sensitive sites such as nest sites, dens, and spawning areas (fine filter). Targets have been set in the FMP to guide forest management activities in a manner that emulates natural disturbance patterns and sustains a diversity of ecosystems and wildlife habitats at the landscape and stand levels. Research projects designed to test the effects and effectiveness of the management approaches used to provide for fish and wildlife are undertaken by the MNRF. The MNRF may work alone or in collaboration with university researchers, the forest industry, the Canadian Wildlife Service, Bird Studies Canada, and others.

2.1.4.2.1 Providing Habitat for Fish and Wildlife

Ontario's Crown Forest Sustainability Act (CFSA) requires the conservation of biological diversity during forest management. However, there are hundreds of species of vertebrates and many thousands of species of invertebrates in the Boreal forest. Among the vertebrates are many with conflicting habitat requirements; some prefer young forest while others prefer older forest; some prefer conifer while others prefer hardwood forest types. In the context of an FMP, it would be impossible to provide for all of them on a species-by-species basis. Therefore, following provincial direction, the Planning Team used a variety of complimentary means to provide habitat for wildlife in the Nagagami FMP, including:

- Emulating natural disturbance patterns and residual structure in harvested stands (coarse filter)
- Forest Landscape Classes
- Harvest Operations
- Renewing harvested areas promptly to provide forest cover types that function as essential habitat (coarse filter)
- Objectives and Indicators
- Silvicultural Ground Rules
- Managing the habitat condition and ensuring that there is adequate mature and old forest, even with harvesting taking place, to provide habitat through time for species that use this habitat (coarse filter)
- Forest Landscape Classes
- Applying AOC prescriptions to protect special or sensitive sites (fine filter)

It is thought that, by emulating natural disturbance patterns and residual structure in harvested stands, renewing sites appropriately, and taking precautions around water, the needs of most species will be addressed over the long term (coarse filter management). Additional species-specific measures (fine filter management) are undertaken for wildlife that are sensitive (e.g., great blue heron and birds of prey) or of local or public interest, such as moose, black bear, and species at risk.

2.1.4.2.1.1 Fisheries Resources

Fish habitat and fish spawning areas are abundant in the Nagagami Forest. There are 2,642 waterbodies (lakes, ponds, and rivers) representing just over 41,000 hectares. As the Nagagami Forest is 448,168 hectares, the waterbodies represent and 9% of the area, including 34 known cool water lakes or ponds (of 846 lakes). This abundant water serves as habitat for a wide variety of game and non-game fish species and populations. Fisheries represent an important resource by:

- providing opportunities for angling (sport fishing);
- offering bait fishing (52 licensed baitfish areas within the Nagagami); and,
- providing subsistence for local Indigenous communities.

Fisheries are the foundation for many of the remote tourism camps found within the forest. Fish also perform vital ecological services as both predator and prey species. Serious harm to fish or fish habitat is prohibited under the federal Fisheries Act. Forest management activities could theoretically affect water quality and fish habitat directly by:

- introducing sediments or logging debris into watercourses;
- removing adjacent forest that provides cover;
- altering aquatic food webs and nutrient regimes;
- increasing water temperature after the harvest of shoreline forest; and/or,
- obstructing fish passage with improperly installed or sized crossings.

Protection of fisheries habitat, including spawning areas, nursery areas, feeding areas, and migration routes, is essential. For this reason, the Stand and Site Guide, the Boreal Landscape Guide and the *Environmental Guidelines for Access Roads and Water Crossings* were consulted during preparation of the FMP. Appropriate AOC prescriptions designed to reduce or eliminate negative effects were developed from those sources and can be found in FMP-11. The MNRF, universities, and the forest industry have undertaken research to ensure that the guidelines and resulting AOC prescriptions are effective in protecting water quality and maintaining fish habitat.

Forest management activities could have indirect effects on fisheries resources as well. For example, access could provide new opportunities for sport fishing, and thereby reduce pressure on other lakes. However, access may be undesirable if it facilitates over-exploitation of a sensitive resource, or conflicts with other users.

In 2005, the MNRF introduced the *Ecological Framework for Recreational Fisheries Management* (EFFM) and in 2008, new Fisheries Management Zones (FMZ) were created. The EFFM has been developed to guide the management of recreational fisheries in Ontario since the District Fisheries Management Plans developed in the early 1980s have since expired. The main components of the

EFFM were to streamline regulations, to develop the FMZ and Zone Advisory Councils, and to conduct broadscale monitoring of fisheries. Broadscale monitoring has been conducted on several lakes within the Nagagami Forest such as Haken, Hiawatha, Kabinakagami, Nagagami, Nameigos, and Shekak lakes to determine the current state of these fisheries within FMZ 7. The Nagagami Forest falls almost entirely within FMZ 7, except for a 2,600-hectare area in the southeastern portion of the forest that falls into FMZ 8. The Advisory Council for FMZ 7 has yet to be developed. Once the council is established, the current fishing regulations will undergo a thorough review, and new fisheries management objectives and strategies will be developed for each of the sport fish species.

Depositing a deleterious substance and the harmful alteration or destruction of fish habitat are prohibited under the federal Fisheries Act, which was last amended in 2019. The changes in the Act work to:

- restore protections for fish and fish habitat;
- enhance marine protection and habitat restoration;
- improve management of projects;
- preserve independent inshore fisheries; and,
- strengthen the Indigenous role in project reviews, monitoring, and policy development.

The Fisheries Act requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada. This applies to work being conducted in or near waterbodies that support fish that are part of or that support a Commercial, Recreational or Aboriginal fishery. To protect fish and fish habitat and to comply with the Act, efforts must be made to avoid, mitigate and/or offset harm to fish.

The MNRF, universities, and the forest industry have undertaken research to ensure that the guidelines and resulting AOC prescriptions are effective in protecting water quality and maintaining fish habitat. The MNRF has developed a water classification system based on the sensitivity of all the waterbodies and watercourses within the Nagagami Forest, designating them as high, medium, or low sensitivity. Special regulations have been introduced for several waterbodies outside the context of the FMP (see provincial fishing regulations for FMZ 7) to reduce fishing pressure and enhance fisheries, including 10 fish sanctuaries that are within the Nagagami Forest.

Fish spawning habitat for walleye is widespread in the Nagagami Forest and is protected through fisheries legislation as well as AOC prescriptions. Wawa District also conducts regular fish stocking on certain lakes in the Nagagami Forest to provide additional angling opportunities as well as to alleviate some of the fishing pressure from the natural self-sustaining lakes. Wawa District stocks 10 lakes on the Nagagami Forest with either brook trout, splake or lake trout. These lakes include Belanger, Dismal, Doran, Loon, Lovely, Norn, Shaw, That Man's, The Other Man's, and Wilson.

2.1.4.2.1.2 Moose

Moose are found predominantly in the Boreal forest, though they also live in the Great Lakes – St. Lawrence forest. Moose are generally absent in southern Ontario because of the clearing of land and perhaps overlap with white-tailed deer that carry a brainworm that is fatal to moose. Moose are generally animals of forest edges, living in proximity to young deciduous stands which provide food,

and semi-mature and mature conifer which provide shelter from weather and predators, including hunters. They are well adapted to extreme cold and snow when food and shelter conditions are adequate. Their large bodies are well insulated, and their long legs make movement through snow relatively easy. Unless they are hampered by very deep snow (greater than 80 cm), their size and strength are sufficient to cope with most factors in their environment.

In spring and early summer, moose feed extensively on selected species of aquatic plants whenever they are available. These plants contain important dietary items and may supply certain nutrients (e.g., sodium), not found in other items of their diet. Travel to these aquatic feeding areas is often along well-defined routes or corridors. Mineral licks are also used at this time of year. In summer, fall and early winter, most feeding occurs in early successional, terrestrial plant communities. Cutovers and burns are especially important. In winter, moose seek out areas of conifer for shelter, and may use portions of nearby cutovers or burns for feeding if snow is less than approximately 80 cm and is not heavily crusted. During the winter months, moose feed almost exclusively on twigs and branches of woody plants, such as willow, birch, aspen, hazel, and mountain ash. In winter, their metabolic rate is lower than in summer and they use their stored body fat to supplement food sources. Moose conserve energy by minimizing their movements. These adaptations to cold and snow help them to survive in northerly forested areas.

Moose and other wildlife are active throughout the entire forest. The ability of the forest to support moose changes through time. These changes can occur slowly as a forest develops and matures, or they may occur quickly because of such events as fire, insect damage or logging. Such factors acting throughout moose range affect the type, quantity, and quality of vegetation, and thus affect the numbers, location, and physical condition of moose that the forest will support.
Prime moose areas are those that produce or attract, or have the potential to produce or attract, a significantly higher number of moose than surrounding areas at certain times of the year. These areas can be identified as being key components of moose habitat on a local basis.

There are two main types of prime moose areas in the Boreal forest. The first type is seasonal high-use or winter concentration areas which are known to be important to moose for a wide variety of reasons. The second type includes special sites such as mineral licks, calving areas, and aquatic feeding areas that may require reserves of timber to protect the special nature of the site. The second type will remove a small percentage of the land base from timber production. The first type will not remove any land from timber production but will require modified harvesting techniques and may require removing the allowable cut for the operating period from a larger planning area.

Early winter concentration areas may be typified by mature or over-mature, open-canopy, mixed-wood stands of relatively low stocking (less than 60%). There is a need to leave portions of these stands uncut for a period to allow the animals to continue to use them. As well, burns and cutovers, usually from 5 to 20 years of age, are also often used. Because of the open canopy, early winter concentration areas usually have considerable browse. These sites are also important to moose as they provide some lateral protection from winds as well as predators. The shape, abundance and nature of these areas is so variable that each must be treated on an individual basis.

Late winter concentration areas are typically where the average moose density is higher than the surrounding area. Generally, they are well stocked stands of mature conifer (greater than 70% stocking) with complete crown closure which provides overhead protection from snow accumulation and severe cold.

Aquatic feeding areas, mineral licks and calving sites are important to moose because they attract moose and contain critical components of their diet or important life history features. Identification of these areas, their shape and importance must be determined by District staff. It is important to maintain both the integrity of the sites and sheltered access by moose to them.

Of the moose habitat features outlined above, for the Nagagami Forest, the MNRF currently has information for aquatic feeding areas, a calving site, and early and late wintering areas, while mineral licks have not yet been identified. Detailed records of pre-industrial population numbers are not readily available, but it has been suggested that the geographic range of moose has not changed in northern Ontario since the 1950s. However, moose have undoubtedly been in the Nagagami area since pre-industrial times. Moose range has expanded into the Great Lakes – St. Lawrence forest over the last 30 to 40 years, but significant range changes have not occurred in the north.

Moose may respond quickly to increases in early successional (young) habitat due to disturbances such as fire and timber harvesting but hunting pressure can affect the magnitude of the response. Food supplies and weather conditions are thought to limit large herbivores such as moose in the absence of hunting. Thus, it is expected that moose experienced significant population changes in the Nagagami Forest area in pre-industrial times, mainly in response to changes in habitat caused by fire.

The MNRF is responsible for the protection and management of Ontario's cervid species as per the *Cervid Ecological Framework* (2009). Moose management is focused on maintaining sustainable populations through population and habitat management. Ontario's moose program is focused on ensuring sustainable moose populations and the ecosystems on which they rely, for the continuous provision of ecological, cultural, economic, and social benefits for the people of Ontario.

Moose habitat is managed at the course level throughout the Nagagami Forest using Landscape Guide indicators. The indicators that most closely align with moose habitat are young, mature, and old forest in terms of structure, composition, and pattern. The intent of the coarse filter is to maintain biodiversity at the landscape level with opportunities for enhancement. Moose are habitat generalists and can use a broad range of forest conditions to meet their needs. In most cases, moving towards the type and distribution of habitats that is expected under natural disturbance patterns will also provide a suitable matrix of habitat for moose.

In some cases, certain aspects of the amount and arrangement of forest may be targeted for management. Large Landscape Patches (LLPs) with targets/objectives specific to Nagagmi Forest can be used to emphasize moose habitat within a specific geographic area. These LLPs (commonly referred to as Moose Emphasis Areas, or MEAs) should be implemented to achieve a specific goal related directly to moose habitat, where it is determined that the current system (i.e. the *Forest Management Guide for Boreal Landscapes*) of meeting landscape level habitat objectives is insufficient.

As part of planning for the long-term management direction (LTMD) and operational phases of the Nagagami FMP, a review of moose habitat on the forest was undertaken. According to the *Forest Management Guide for Boreal Landscapes*, LLPs will be identified to meet biodiversity objectives and to allow for the efficient implementation of other guides. The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (2010) states that moose habitat, where appropriate, is to be enhanced in Moose Emphasis Areas (MEAs). MEAs will be strategically located in productive, nutrient-rich areas most likely to achieve a moderate to high density of Moose. The LLPs where moose habitat management will be emphasized will contain targets for a range of young forest patch sizes for browse and a relatively high proportion managed as mixedwoods/hardwoods and mature conifer for cover. The MEA selection process is described in section 6.1 (t) of the Supplementary Documentation and road use management strategies within MEAs are discussed in section 6.1 (i) of the Supplementary Documentation.

2.1.4.2.1.3 Black Bear

Black bears are a natural part of forested habitats and an integral component of healthy ecosystems. The presence of black bears is an indication of reasonably functioning terrestrial and watershed ecosystems. A landscape that can support the habitat requirements of one of the largest terrestrial carnivores can support a variety of other plant and animal species. As omnivorous carnivores, black bears use a variety of natural foods that allow them to live and thrive over a wide range of climatic and habitat types. Black bears are primarily inhabitants of forested areas where they are best able to meet their needs for cover, food, and security from predators including other bears. Black bears have relatively short, unspecialized digestive systems, much like humans. Vegetation is the principal component of their diet, but they also consume animal protein through scavenging and predation on insects, mammals, and fish. Bears can be a predator of young and adult large mammals such as moose. More recently, there has been renewed interest and concern about the status of black bears. Some contend that bear populations need to be sustained and harvest controlled because they are a long-lived species with low reproductive potential and a high sensitivity to changes in adult survival. Others maintain that increased numbers of bears, particularly during the cancellation of the spring open season in 1999 (since reinstated in the WMUs within the Nagagami Forest), caused unacceptable levels of predation on wild species (e.g., moose), and pose a threat to property and public safety when they are attracted to communities in search of food. Almost the entire province has habitat that supports populations of black bears.

The Nagagami Forest contains 49 Bear Management Areas (BMAs) that are licensed to black bear hunting outfitters. The MNRF collects data on both resident and non-resident hunting activity and harvest for each of the spring and fall seasons through a mandatory reporting requirement. The sustainable harvest rate of black bears is between 5% to 10% of the population. MNRF is awaiting results from bear population surveys conducted using the barbed wire hair trap method. Considering the rate and extent of change in land use patterns within bear range, there is a need to develop an enhanced management program that will ensure the sustainability of black bears while minimizing threats to property and public safety.

2.1.4.2.1.4 Marten, Beaver, Fisher, and Other Furbearers

Furbearers have been trapped for commercial use in Ontario for a very long time. Based on trapping records, maps of historical fur trapping zones were produced dating back to the 1600s. These maps suggest that the area now known as the Nagagami Forest was one of many sources of furs purchased by the Hudson Bay and Northwest Companies. In the 1700s and 1800s, beavers and martens were the most frequently trapped furbearers. Data provided by MNRF for the vicinity of the Nagagami Forest suggest that beavers and martens continued to be the most often harvested furbearers over the period from 1949 to the present.

There are currently 39 registered trapline areas within or overlapping the Nagagami Forest. Licensed trappers must use humane techniques to capture furbearing animals such as beaver, otter, marten, fisher, mink, weasel, lynx, coyote, and wolves. The MNRF works with trappers to protect these wildlife populations and habitat by setting quotas, collecting harvest information, and reducing human and wildlife conflicts.

2.1.4.2.1.5 Herons and Birds of Prey

MNRF's LIO database documents two great blue heron colonies in the Nagagami Forest, as well as 28 osprey and 61 bald eagle nesting sites. There are likely to be more nests that have not been found outside areas of operations, thus the number known in the Nagagami are likely higher. To protect herons, ospreys, and eagles, AOC prescriptions developed based on guidance in the Stand and Site guide are applied around known nesting sites along with those found during operations.

The northern goshawk is widely but sparsely distributed across the Boreal forest in Ontario and there are a few records within the Nagagami. There are several nests of Cooper's hawks, broadwinged hawks, red-tailed hawks, and goshawks on the Nagagami Forest. AOC prescriptions have been developed for the Cooper's hawk, barred owl, merlin, sharp-shinned hawk, red-tailed hawk, broadwinged hawk, long-eared owl, great horned owl, common raven, and nests of unknown species.

2.1.4.2.1.6 Songbirds

In other FMPs co-developed by the MNRF and SFLs, conservation strategies for songbird species recommended by organizations such as Partners in Flight have been considered. These species were identified due to small or declining population, limited geographic distribution, or significant threats to their habitat. In such cases, the Planning Team sought an objective means to determine if any of the songbirds should be locally featured, recognizing that, theoretically, the coarse filter approach to providing habitat (providing a range of habitat types, ages, and structures in approximately natural amounts) should be sufficient to provide for most species.

2.1.4.3 Natural Resources, Land Uses and Values

The MNRF manages values information and has produced a series of values maps in accordance with the requirements of the *Forest Information Manual*. The values maps provide a summary of the geographical locations of known natural resources features, land uses and values for the Nagagami Forest, including parks and protected areas. The values map information has been considered in the development of the 2021 Nagagami FMP. The values maps are intended to be used primarily as

background information for planning but are also used as displays to solicit additional information about natural resource features, land uses and values from the public.

The values maps are continually updated as information is assembled during the public consultation in the process of the FMP development and during implementation of the FMP. Sources of information used to develop the maps include:

- Fisheries habitat and population surveys;
- Protected area regulation plans;
- Protected area inventories;
- Protected area management direction documents;
- Wildlife habitat inventories;
- MNRF staff, forest industry and public reporting;
- Indigenous reports and/or cultural heritage values studies;
- Ministry of Energy, Northern Development and Mines (MENDM);
- Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI);
- Ontario Base Map (OBM) features; and,
- Natural Heritage Information Centre.

MNRF updates and provides the most current, relevant information available on natural resource features, land uses and values, including cultural heritage resource sites and features, for use in forest management planning.

The MNRF values information is stored in the LIO database. The LIO database is a Geographic information System (GIS) based system for managing the storage of the MNRF digital land related information in a standardized manner. It provides the ability to store, maintain and access over 600 different geographic feature types.

Information about certain values such as, the location and description of Indigenous values, cultural heritage sites, sites of Species at Risk, rare vascular plants, fish spawning areas, etc. may be considered as sensitive information that, if released or portrayed on maps may pose a threat to the existence, integrity, or health of those values. Sensitive information about values shall not be made available to the public. Where the availability of information could be considered as potentially detrimental to the existence of a value, the MNRF shall determine whether or how the value can be depicted on a values map.

In general, the lands and waters within the Nagagami Forest have been surveyed over the past several years and during previous FMP planning processes. Values information is updated continuously as new values are identified, or it is confirmed that previously identified values no longer exist (stick nests). Values information must be considered the “best available” at the time of plan preparation however values information is continually being updated.

The values information is provided on maps. The values maps are found in Section 6.1 (u) of the Supplementary Documentation. The following list provides the land and resource uses identified on the

MNRF values maps, by map (base features such as roads, lakes, streams, pipelines, patent land are common to each map):

- MU123_2028_FMPDP_MAP_ValFish_00.PDF – and baitfish lakes;
- MU390_2021_FMPDP_MAP_ValBMA_00.pdf – Bear management areas;
- MU390_2021_FMPDP_MAP_ValCult_00.pdf – Cultural heritage values;
- MU390_2021_FMPDP_MAP_ValFish_00.pdf – Fisheries and wetland areas, including water sensitivity, baitfish areas, wetlands, fish migration routes, spawning areas, food supply area;
- MU390_2021_FMPDP_MAP_ValLand_00.pdf – Land values, including aggregate permits, access-controlled roads, Crown leases and LUPs, active mining claims, municipal boundaries;
- MU390_2021_FMPDP_MAP_ValRBT_00.pdf - including tourism camps, canoe route, trails (skidoo, portage, Ontario trail network), recreation access point, camping sites;
- MU390_2021_FMPDP_MAP_ValRec_00.pdf – Resource uses, including waste disposal sites, cottages, potable water, forest processing facility, towers, work camps, utility sites, peat, wild rice, tourism camps, trails, recreation access point, camping sites;
- MU390_2021_FMPDP_MAP_ValTrap_00.pdf – Trapline areas and trap cabins, trapline areas; and
- MU390_2021_FMPDP_MAP_ValWild_00.pdf - values, including mineral licks, moose aquatic feeding areas, forest research areas, tree improvement areas, mast producing areas, travel corridors, calving sites, wintering areas, nesting sites.

FMP Management Implications - The MNRF values mapping has implications for the development and implementation of the FMP, which include:

- The placement of the various road restrictions on the forest, in accordance with higher land use policy such as the Crown Land Use Policy Atlas (CLUPA);
- The development of AOC prescriptions to protect various values (FMP-11);
- The selection of the location of primary, branch and operational roads and road corridors;
- Protection of riparian habitat zones, and generally providing opportunity for fish, wildlife;
- Other resources dependant on forest cover;
- Placement of harvest allocations.

These implications to the development of the FMP were managed by the Planning Team and are discussed in Section 3.2 and Section 4.2. In short, values are managed in accordance with land use direction policy and in land use areas where forestry operations are permitted, the FMP includes AOC prescriptions to prevent, minimize, or mitigate adverse effects of forest management activities on values (FMP-11).

2.1.4.3.1 Remote Tourism

The Tourism and Forest Industry Memorandum of Understanding (MOU) is an agreement between the government, the tourism industry, and the forest industry on the development of Resource Stewardship Agreements (RSAs) and related matters. An RSA is an agreement negotiated between two legal entities:

1) A Resource-Based Tourism Establishment (RBTE) operator and
2) The Sustainable Forest Licensee

Essentially, the parties agree, through negotiations of an RSA, to apply forest management operational prescriptions to protect specific tourism values and roads planning and/or related conditions on new and existing roads that affect forest management that will be approved by the MNRF and included in the FMP. The RSA may also include other provisions the parties agree to that are not part of the FMP. There are 21 tourist outfitters in the Nagagami Forest (or within a kilometer of the border), which are listed below. There are 22 remote tourism lakes in the Nagagami Forest.

Table 2. Tourism outfitters in Nagagami Forest, including location and remoteness class

Tourism outfitter name	Location(s)	Remoteness class
Garson's Fly-In Outpost Limited	Cree Lake	Drive-in
	Kabinakagamisis Lake	Remote
	Lascelles Lake	Remote
Rock's Hunt Camp	3 km south of Hornepayne	Drive-in
Camp Larkin	West Larkin Lake	Drive-in
Watson's Algoma Vacations Ltd.	Kabinakagamisis Lake	Remote
Chisholm's Kaby Kabins	Kabinakagamisis Lake	Remote
Everson's Lodge	Kabinakagamisis Lake	Remote
Horne Air	Kabinakagamisis Lake	Remote
Travel Algoma Ltd.	Nagagami Lake	Remote
Kay-Vee Lodge Ltd.	Nagagami Lake	Remote
Expeditions North	Nagagami Lake	Remote
White River Air	Nameigos Lake	Remote
	Bruce Lake	Remote
Hawk Air	Nameigos Lake	Remote
	Breckenridge Lake	Remote
	Pichogen Lake	Remote
Outpost Camps Inc.	Nameigos Lake	Remote
	Ermine Lake	Remote
	Crescent Lake	Remote
	Moose Lake	Remote
Forde Lake Lodge and Air Service	Frazer Lake	Remote
Olivier’s Fly-In Camps	Linbarr Lake	Remote
	White Owl Lake	Remote
	Bayfield Lake	Remote
Ice Bungalows	Lessard Lake	Remote
Granitehill Lodge	Granitehill Lake	Remote
Buck & Bingwood Cabins	Obakamiga Lake	Remote
612372 Ontario Ltd (White River Air)	Shekak Lake	Remote
Commercial Outpost Camp	McCoy Lake	Remote
Johnston's Outpost Camps	Bayfield Lake	Remote
Gaudreau's Enterprise Ltd.	Larkin Lake	Remote

The majority of the RBTE's operating on the Nagagami Forest are members of the Algoma Wilderness Tourist Association, a group who, with Hornepayne Lumber LP Inc. and Columbia Forest Products Ltd., agreed to the principles to be incorporated into individual RSA's. Representatives from the parties then developed a template RSA that could be customized for each agreement.

The SFL company has contacted all the RBTE's with an interest in the Nagagami Forest and have offered to develop an RSA, with some agreements in development at draft plan submission. Hornepayne Lumber LP has developed good working relationships with the RBTE's that operate on the Nagagami Forest and further progress in the development of RSA's is expected to continue.

Tourism values and natural resource features are considered during forest management planning through the development of AOCs. These prescriptions are included in FMP-11. The planning team contacted the tourist operators several times throughout development of the FMP to ensure any known concerns are discussed and if warranted, operations planned in the FMP are adjusted to mitigate the concern and adequately protect identified values. The 2021 Nagagami FMP is committed to maintaining the viability of the tourism industry by protecting tourism values in the forest management planning process through the application of the *Management Guidelines for Forestry and Resource-Based Tourism.*

2.1.4.3.2 Mineral, Aggregate and Quarry Pits

There are 28 aggregate permits in the Nagagami Forest, 2 of which are for quarries. There are no mines in operation.

There are minimal impacts between forest management activities and mineral, aggregate and quarry pits. Annually, mining claim holders are notified of forest management activities scheduled on their respective mining claims. Harvest and silviculture activities must not damage or destroy claim posts. Obtaining good sources of aggregate on Crown land is a consideration during primary and branch road planning and when identifying operational road boundaries. A lack of suitable aggregate sources for the construction and maintenance of forest access roads can result in long aggregate haul distances, or the increased use of winter access for timber extraction.

2.1.4.3.3 Parks and Protected Areas

The purpose of Ontario's Provincial Parks and protected areas is to permanently protect a system of provincial parks and conservation reserves that includes ecosystems that are representative of all of Ontario's natural regions. In addition, provincial parks aim to:

- Protect provincially significant elements of Ontario's natural and cultural heritage;
- Maintain biodiversity;
- Provide opportunities for compatible, ecologically sustainable recreation.

Ontario's provincial parks and conservation reserves are dedicated to the people of Ontario and visitors for their inspiration, education, health, recreational enjoyment, and other benefits with the intention that these areas shall be managed to maintain their ecological integrity and to leave them

unimpaired for future generations. The following are important benefits and help to demonstrate how provincial parks support our quality of life:

- Protection and contribution to ecological functions (air quality, water quality, flood control, soil stabilization);
- Biodiversity contributions (genetic material, protection of species at risk);
- Protection of resource integrity (some of the last green spaces left in the province);
- Health effects from use of parks (mental, physical, spiritual benefits);
- Worker productivity (healthy and happy workers tend to be more productive - a visit to a provincial park can contribute);
- Educational benefits (young and old learning about our environment);
- Scientific benefits (research in provincial parks);
- International responsibilities to protect natural settings, features, and wildlife;
- Business location decisions (quality of life/business) and community cohesion.

Table 3 summarizes the provincial parks and conservation areas that intersect or are within the Nagagami Forest. Also included is the identification number, type, area, and the area on the Nagagami Forest. The total forest area within parks and conservation reserves is just over 3,000 hectares (<1 %) of the total area within the Nagagami Forest.

Table 3. Provincial Parks within Nagagami Forest

Number	Name	Class	Area (ha)
P123	Nagagami Lake Provincial Park	Nature Reserve	1,720
P1524e	Nagagamisis Provincial Park	Natural Environment	1,351
P1530	Pichogen River Mixed Forest Provincial Park	Nature Reserve	70

An AOC prescription has been developed to ensure the integrity of provincial parks (FMP-11).

2.1.4.3.4 Crown Land Recreation and Cottaging

The Nagagami Forest has attracted recreation-based tourism since the late 19th Century due to its variety of natural values. The area continues to be a desired recreational destination for canoeing, boating, fishing, hunting, hiking, snowmobiling, camping and cottaging for the following reasons:

- There is a high concentration of interconnected lakes, rivers, and portages;
- The rugged topography including cliffs, low wetlands, viewpoints, and island-dotted lakes;
- The lakes provide excellent scenery for summer and winter travelers;
- In the summer, canoeist and hikers can access remote locations.

The large variety of lakes and rivers, some of which are remote and others easily road accessible, provide a wide range of angling opportunities. The Nagagami Forest has excellent brook trout and walleye fishing.

There are a wide variety of trails on the Nagagami Forest that are used (depending on the nature of the activity and the Land Use designation) by hikers, cross country skiers, dog sledders, snowmobilers, and ATV operators. In addition to prepared trails, there are opportunities to travel into ungroomed areas

such as snowshoeing along lakes and portages or snowmobiling along ungroomed lakes or unplowed roads.

The Nagagami Forest has several waterways identified as suitable for providing a variety of canoeing and kayaking experiences. Canoe routes have been identified as Category A or deemed Category B (i.e., traditional canoe routes not specifically identified in the Crown Land Use Policy Atlas but afforded similar protection as a Category B canoe route. Category A routes include:

- Kabinakagami River;
- Nameigos River; and,
- Oba River.

Deemed Category B routes include:

- Nagagami Canoe Route (from Nagagami Lake/Obakamiga River to Granitehill Lake);
- White Owl Canoe Route (from Deadwater Creek/Jackfish River to Shehak River to Sand Lake);
- Larkin Lake Canoe Route (Shekak River to Larkin Lake to Beaton River to Hwy 631); and,
- Foch River Canoe Route (Foch River).

Implications - Forest management activities within the Nagagami Forest are planned with consideration for the effects of forest operations on various natural and man-made values associated with Crown land recreation and cottaging. Examples of this consideration include:

- Natural features, such as water bodies, canoe routes, bird nests or colonies, and furbearer dens, are considered through the AOC planning process (FMP-11);
- Certain man-made features are also specifically considered through the AOC planning process (growth and yield plots, railways, cultural heritage values and portages);
- Trails, where possible, are left clear of debris from harvesting operations and in many cases, previous forest access roads are used as snowmobile trails. Access to snowmobile trails is typically addressed during FMP implementation through annual communication and/or agreements between the snowmobile club and the SFL to address club use of SFL roads.

2.1.4.3.5 Fur Trapping

Trappers are active on the Nagagami Forest and use many active and inactive logging roads and trails to access the traplines which cover the entire forest. There are 31 traplines registered on the Nagagami Forest (i.e., area within the Nagagami Forest or whose boundaries are as close to 1 km to the management unit boundary), with 27 of these traplines currently in use. There are 16 First Nations traplines within the Nagagami Forest (or within 1 km of its boundary), with 12 currently in use. Refer to the values maps in the Other Documentation Section 6.2.5 to view the traplines on the Nagagami Forest. Each trapline is operated by a "01" trapper who holds the license for the trapline. The 01 trapper may be assisted by a 02 or in some cases a 03 trapper.

All primary trappers are on the FMP mailing list and have had the opportunity to review and provide comments on planned forest operations in the Nagagami Forest. Individual trap line boundaries, as well as known trapline cabins and trails are considered values and mapped. Where identified values are adjacent to or within areas planned for forest operations, AOC planning may be initiated to mitigate any negative impacts on the value. Typically, AOC prescriptions include strategies such as

areas reserved from harvesting around trapline cabins, protection of trails and in some cases, other provisions to address additional concerns brought forth by trappers.

Implications - Wildlife habitat has been considered during development of the Long-Term Management Direction for the FMP. AOC prescriptions have been developed to protect trap cabins.

2.1.4.3.6 Patent Land

Patent land comprises approximately 2,500 hectares of private land on the Nagagami Forest, which is a very small portion (less than 1%) of the total landbase area as described in Section 2.1.2. In accordance with the *Crown Forest Sustainability Act,* patent land is not included in this FMP. Patent land was not included in the strategic modelling for this plan, nor is any forest management activities proposed in this FMP on any patent land.

Implications – As there is very little patent land on the Nagagami Forest it does not have any significant effect on the development or implementation of the 2021 FMP.

2.1.4.3.7 Crown Land Use Policy Atlas

The Wawa MNRF District just concluded a major land use amendment to the provincial Crown Land Use Policy Atlas (CLUPA) in 2016. The new CLUPA policies includes land use direction for all unregulated Crown lands and waters within Wawa District. The Nagagami FMP will be consistent with higher order Crown land use plans such as CLUPA.

The Nagagami Forest is split between three Crown Land Use Policy Atlas policy areas

- E1771r Northeast Superior recreation access area;
- G1798 West Multiple Resource Management Area; and,
- G1787 East Multiple Resource Management Area.

<u>E1771r Northeast Superior Recreation Access Area</u>

This area is located centrally in Wawa District, bounded by the Trans Canada Highway (17) to the south. In addition, it stretches from the community of White River northward to the community of Hornepayne and encompasses a significant variety of roads and trails for all recreational activities in all seasons. This area contains the following Designated Remote Tourism Lakes:

- Breckenridge Lake
- Bruce Lake
- Cigar Lake
- Nameigos Lake

This is an important recreational, tourism and resource sector (forestry, mining) area. It contains interconnecting roads and trails, lakes and rivers and rugged scenic topography with good recreational capability. Existing activities include, but are not limited to forestry, Crown land recreation, sport fishing, hunting, trapping and resource-based tourism. This area also contains lake(s) designated for lake trout management.

Land use direction and resource management activities will be compatible with enhancing and maintaining the natural and recreational values of the area. The land use intent of this area is to promote and enhance opportunities for a diverse set of recreational activities for the benefit of

communities located in the Wawa District. Priority will be given to activities that promote well planned access for enhanced recreational activities, community connectivity and improved resource use in the area. The area boundaries follow established district and private land boundaries, as well as primary roads, bounding the area to as many natural features as possible. The boundaries also allow for improved connectivity of communities through the development of road corridors.

G1798 West Multiple Resource Management Area

This large area comprises the greater part of Wawa District, including Crown land that surrounds Manitouwadge, Hornepayne, Wawa and well as Crown land south of White River. The area comprises portions of all FMUs within the Wawa District. Within this area, most activities are presently ongoing and will continue; this includes normal programs of forest management, the disposition of Crown land for commercial tourism facilities, the management of fish and wildlife resources and exploration and development of mineral resources including aggregate.

This area contains the following Designated Remote Tourism Lakes:

- Ahmabel Lake
- Bayfield Lake
- Buffalo Island Lake
- Fraser Lake
- Lessard Lake
- Linbarr Lake
- McCoy Lake
- Nagagami Lake
- Obakamiga Lake
- Granitehill Lake
- Shekak Lake
- White Owl Lake

This area also contains lake(s) designated for lake trout management. The intent of this area is to promote and encourage a multitude of uses and provide an environment where resource uses take place with minimized conflict. Primary activities and uses include Crown land recreation, forest management, mineral exploration and extraction, commercial power development, hunting, fishing, camping, tourism, and various other commercial and recreational activities. The renewable resources in this area will continue to be managed on a sustained yield basis. The control of road locations and their use will be managed to maintain acceptable levels of angling and hunting and other recreational uses. Identified tourism lakes will be managed to protect their remote quality.

G1787 East Multiple Resource Management Area

This large area comprises the most eastern part of the Wawa District. The area is primarily located within the Magpie and Nagagami Forest Management Units. The area is enclosed by the Chapleau District border to the east and south, and E1771r - Northeast Superior Recreation Access Area and G1798 - West Multiple Resource Management Area to the west and north.

Within this area, most activities are presently ongoing and will continue; this includes normal programs of forest management, the disposition of Crown land for commercial tourism facilities, the management of fish and wildlife resources and exploration and development of mineral resources including aggregate. This area contains the following Designated Remote Tourism Lakes:

Within this area, most activities on the land base are presently ongoing and will continue; this includes normal programs of forest management, the disposition of Crown land for commercial tourism facilities, the management of fish and wildlife resources and exploration and development of mineral

resources including aggregate. A significant portion of this area is overlain by the Chapleau Crown Game Preserve (see policy report G1787/CGP2).

This area contains the following Designated Remote Tourism Lakes on the Nagagami Forest:

- Cameron Lake
- Larkin Lake (West Larkin)
- Kabinakagami Lake
- Cresent Lake
- Ermine Lake
- Kabinakagamisis Lake
- Lascelles Lake
- Moose (North) (Tony) Lake
- Pichogen Lake
- Upper Pichogen Lake

This area also contains lake(s) designated for lake trout management. The intent of this area is to promote and encourage a multitude of uses and provide an environment where resource uses take place with little conflict. Primary activities and uses include Crown land recreation, forest management, mineral exploration and extraction, commercial power development, hunting, fishing, camping, tourism, and various other commercial and recreational activities. The renewable resources in this area will continue to be managed on a sustained yield basis. Identified tourism lakes will be managed to protect their remote quality.

All resource extraction/management plans will contain and follow guidelines set out by the District and MNRF, to protect and promote tourism and recreational values, historical and archaeological sites, and significant fisheries and/or wildlife values.

Implications – Forest management activities within the Nagagami Forest are planned with consideration for the effects of forest operations on various resource-based tourism and natural self-sustaining lake trout lakes. Examples of this consideration include:

- Natural features, such as remote tourism lakes, self sustaining lake trout lakes, canoe routes and portages, bird nests or colonies, and furbearer dens, are considered through the AOC planning process (FMP-11);
- Access restrictions will be placed on forest access roads within the vicinity of remote tourism lakes to limit unauthorized access to designated remote tourism lakes;
- There will be seasonal timing restrictions on forest management activities that are within 1 or 2 kilometres of designated remote tourism lakes;
- There will be road construction restrictions in place when constructing roads close to natural self-sustaining lake trout lakes.

2.1.4.3.8 Strategic Forest Access

The Nagagami Forest has a well-developed existing road network. The existing roads have been constructed and maintained for forest management activities and will continue to provide access throughout the 2021-2031 FMP.

Maintenance of the existing road infrastructure required to access 2021 FMP harvest allocations will occur and include activities such as gravelling, grading, widening, brushing, straightening and the construction of minor by-passes at locations where steep terrain conditions prevent safe line of sight to oncoming traffic, unplugging culverts; slope stabilization; snow plowing and sanding during the winter months; and bridge maintenance. The largest function of maintenance is to ensure that water crossings continue to be effective, to fulfill their design requirements and ensure the roads are kept in shape to provide safe vehicular travel whether for forest management activities or the public. Existing roads and selected primary and branch road corridors for the 2021-2031 period are portrayed on all the Ontario Base Maps (OBM) for operations as well as the following overview maps:

- MU390_2021_FMPDP_MAP_Overview_01.pdf
- MU390_2021_FMPDP_MAP_Overview_02.pdf
- MU390_2021_FMPDP_MAP_SUM_01.pdf
- MU390_2021_FMPDP_MAP_SumFR_02.pdf
- MU390_2021_FMPDP_Rums_00.pdf

Each new primary or branch road, existing road, or road network, which is the responsibility of SFL holder, has a use management strategy, and this information can be found in Supplementary Documentation 6.1, Section (i) Roads Planning and Roads in Areas of Concern.

2.2 SOCIAL AND ECONOMIC DESCRIPTION

The social and economic description (SED) provides relevant details on communities, forest resource processing facilities and groups (industrial and non-industrial) that are socially and economically impacted to a significant degree by forest management activities on the Nagagami Forest, and First Nation and Métis communities in or adjacent to the Nagagami Forest whose interests or traditional uses may be affected by forest management activities. This information is used to determine the expected social and economic impacts of implementing the Long-Term Management Direction.

2.2.1 Demographic Profiles

The following community demographic profiles provide quantitative socio-economic data that can be assessed for trends and sensitivity related to forest management activities.

2.2.1.1 Local Communities

The communities identified as socially and economically impacted to a significant degree by forest management activities on the Nagagami Forest are:

- Hornepayne

- White River
- Dubreuilville
- Terrace Bay
- Schreiber
- Hearst
- Wawa

The communities were selected based on both proximity to a forest resource processing facility actively receiving significant volume from the Nagagami Forest in any form and labor force home base. A summary of each community's demographic profile can be seen in Table 4 below, and the text following provides points of interest as provided by each community's economic development officer. All information was shared with each community's economic development officer with a request for input.

Table 4. Demographic profile of communities socially and economically impacted to a significant degree by forest management activities on the Nagagami Forest

Metrics		Community						
		Hornepayne	White River	Dubreuilville	Terrace Bay	Schreiber	Hearst	Wawa
Population[1]	Total Population 2016	980	656	613	1,611	1,059	5,070	2,905
	5-year Change in Population	-7.14%	5.89%	-3.59%	8.69%	-6.33%	-0.39%	-2.41%
	Average Persons/Household	2.4	2.2	2.4	2.1	2.1	2.1	2.2
Labour[1]	Total Labour Force	565	350	300	825	575	2,610	1,510
	Employment Rate	81.3%	97.1%	91.7%	89.8%	90.4%	94.80%	93.7%
Average Individual Income[1]	Male	$72,831	$55,085	$57,316	$59,451	$56,257	$53,214	$49,524
	Female	$38,098	$33,524	$34,690	$39,068	$29,892	$36,228	$37,269
Average Household Total Income[1]		$108,279	$85,244	$91,230	$88,290	$79,158	$78,759	$81,422
Community Diversity and Heritage[1]	Canadian Born	98.4%	95.5%	100.0%	92.8%	92.4%	98.5%	94.4%
	Foreign Born	1.6%	4.5%	0.0%	7.2%	7.6%	1.5%	5.6%
	Canadian Citizen	99.0%	97.7%	100.0%	95.3%	98.2%	99.3%	98.8%
	Indigenous Identity	9.8%	25.8%	5.6%	8.8%	7.6%	7.0%	13.1%
Official Language[1]	English	77.2%	81.4%	8.1%	87.7%	93.4%	6.2%	67.3%
	French	1.6%	0.8%	24.4%	0.0%	0.0%	23.3%	1.2%
	English and French	20.7%	17.8%	67.5%	11.6%	6.6%	70.5%	31.3%
	Neither	0.5%	0.0%	0.0%	0.6%	0.0%	0.0%	0.2%
Highest Educational Accomplishment[1]	University	7.4%	7.1%	6.6%	14.8%	12.2%	15.3%	12.9%
	College	19.1%	22.1%	27.5%	29.2%	22.2%	23.2%	21.9%
	Trade	7.4%	21.2%	16.5%	12.5%	15.3%	10.0%	11.7%
	Secondary	34.6%	25.7%	15.4%	28.4%	29.6%	22.9%	29.9%
	Primary	31.5%	23.9%	34.1%	15.1%	20.6%	28.5%	23.6%
Forest Industry Labour Force[2]	% of Total Labour Force	18.6%	20.0%	15.0%	29.9%	13.2%	16.3%	3.7%

Metrics		Community						
		Hornepayne	White River	Dubreuilville	Terrace Bay	Schreiber	Hearst	Wawa
	Dependency Ratio 2016*	23.549	27.362	21.211	52.57	22.435	28.281	3.521
	10-Year Change in Dependency Ratio (2006 to 2016)[2,3]	8.688	-12.122	-38.706	36.870	9.982	7.343	-12.421
	Average Income	$42,660	$39,360	$59,742	$66,435	$66,941	$52,862	$56,360

Sources: [1]Statistics Canada, 2016 National Household Survey (NHS)
[2]Statistics Canada, 2016 Census of Population
[3]Statistics Canada, 2006 Census of Population
*Employment dependency ratio is the ratio of the % of people employed in forestry, compared to the % of people employed in forestry in Ontario.

[1]Schreiber: It was announced in July 2019 that the Government of Canada would be investing $1.67 million into the community to promote new economic, business and tourism-related opportunities. This is in addition to $1.7 million that the Government will be providing to support entrepreneurs in the region stretching from Dorion to Manitouwadge. In addition, there was a press release in August 2018 that detailed the potential for a local zinc mine to reopen under Australian ownership.

2.2.1.2 First Nations and Métis Communities

The Nagagami Forest is host to a variety of resources important to the Indigenous way of life. It helps provide a source of traditional foods and medicines and a place where First Nation and Métis peoples can carry out cultural practices. Indigenous peoples also participate in the forest economy.
The Indigenous communities whose interests or traditional uses may be affected by forest management activities on the Nagagami Forest have been identified as:

- *Brunswick House First Nation*
- *Biigtigong Nishnaabeg*
- *Constance Lake First Nation*
- *Ginoogaming First Nation*
- *Métis Nation of Ontario*
- *Pic Mobert First Nation*
- *Red Sky Métis Independent Nation*

The following social and economic summaries of these communities were compiled from census data collected by Indigenous and Northern Affairs Canada (INAC) and Statistics Canada. Geographic locations, population and language data were taken from the INAC website updated in 2019. Employment, vocational and additional language data were taken from the 2016 Statistics Canada census. Additional information was sourced from respective community websites.

This information was shared with each Indigenous community with a request for review and input. Furthermore, each community has an opportunity to provide more detailed information about its relationship with the forest through the preparation of an Indigenous Background Information Report (IBIR), which are summarized in Section 6.1 (c).

Biigtigong Nishnaabeg First Nation (Ojibways of the Pic River First Nation)

Biigtigong Nishnaabeg First Nation is located 16 km southeast of Marathon, Ontario off Highway 17. There are 1,195 registered members, with 538 members living on reserve (INAC 2019). 97.4% of community members identify English as their official language and 2.6% indicate they are bilingual in English and French. 12.4% of the community has knowledge of indigenous language(s). Employment on the reserve is varied, with leading sectors including health, education, agriculture, and resource based. Twenty on-reserve individuals reported as being part of the forestry industry workforce on the 2016 census.

Brunswick House First Nation (BHFN)

Brunswick House First Nation has two reserve locations: The main reserve (Duck Lake 76B) is located six kilometres east of Chapleau on Hwy 101; the other (Mountbatten 76A) encompasses most of the township of Mountbatten, located 20 km southeast of Chapleau. BHFN has a total registered population of 847 people, with 214 living on reserve (INAC 2019). 88.9% of community members identify English as their official language and 11.1% indicate they are bilingual in English and French. 0% of the community indicated knowledge of indigenous language(s). Employment on the reserve is varied, with leading sectors including health, education, agriculture, and resource based. 0% of the on-reserve workforce reported as being in forest industry on the 2016 census.

Constance Lake First Nation (CLFN)

Constance Lake First Nation Constance Lake First Nation is primarily the successor of the English River First Nation, which was considered an offshoot of the Albany Band by the commissioners at the time of signing and conclusion of Treaty 9. It has two reserve locations, Constance Lake 92, and English River 66. Both are located on Constance Lake near Hearst, Ontario, directly north of the community of Calstock. CLFN has a total registered population of 1,761 people, with 871 living on reserve (INAC 2019). 99.2% of community members identify English as their official language and 0.8% indicate they are bilingual in English and French. 23.7% of the community has knowledge of indigenous language(s). Employment on the reserve is varied, with leading sectors including health, education, manufacturing, and construction. Fifty on-reserve individuals reported as being part of the forestry industry workforce on the 2016 census.

Ginoogaming First Nation (GFN)

Ginoogaming First Nation (formerly the Long Lake 77 First Nation) is a small Anishinaabe (Ojibway) First Nation reserve located in Thunder Bay District, located approximately 40 km east of Geraldton, Ontario, on the northern shore of Long Lake, immediately south of Long Lake 58 First Nation and the community of Longlac, Ontario. GFN has a total registered population of 847 people, with 214 living on reserve (INAC 2019). 100% of community members identify English as their official language and 16.7% have knowledge of indigenous language(s). Employment on the reserve is varied, with leading sectors including health, education, agriculture, and resource based. Forty on-reserve individuals reported as being part of the forestry industry workforce on the 2016 census.

Pic Mobert First Nation (PMFN)

Pic Mobert First Nation has two reserves; the first (Pic Mobert North) is located 53 km east of Marathon Township, off Highway 17. The second reserve (Pic Mobert South) is located at the south west end of White Lake, about 53 kilometers east of Marathon Township. There is a total registered population of 1,027 members, with 356 living on reserve (INAC 2019). 95% of community members identify English as their official language and 5% indicate they are bilingual in English and French. 15.4% of the community has knowledge of indigenous language(s). Employment on the reserve is varied, with leading sectors including health, education, manufacturing, and construction. 10 on-reserve individuals reported as being part of the forestry industry workforce on the 2016 census.

Métis Nation of Ontario (MNO)

According to the organization website, "(i)n 1993, the Métis Nation of Ontario (MNO) was established through the will of Métis people and Métis communities coming together throughout Ontario to create a Métis-specific governance structure. Prior to 1993, Métis had been involved in pan-Aboriginal lobby groups and organizations. The MNO was not created to represent all individuals and communities that claim to be Métis, but those individuals and communities that are a part of the Métis Nation."

Red Sky Métis Independent Nation (RSMIN)

The Red Sky Métis Independent Nation`s head office is in Thunder Bay. Membership includes approximately 8,000 citizens who reside in communities throughout the Robinson-Superior Treaty area, Canada and internationally.

2.2.2 Description of the Industrial and Non-Industrial users of the Forest

The following section details industrial and non-industrial forest users that are socially and economically impacted to a significant degree by forest management activities on the Nagagami Forest. Sources of information are varied and are described in each subsection. Individual surveys requesting relevant information were sent to the members of each group, and the response data has been integrated into its respective subsection.

2.2.2.1.1 Forestry and Wood products

The Nagagami Forest is managed under a Sustainable Forest Licence (SFL) held by Hornepayne Lumber Limited Partnership, formed under the laws of the Province of Ontario by its general partner Hornepayne Lumber GP Inc. As per the license, the holder is entitled to harvest and utilize the full available harvest described in the Forest Management Plan for the Nagagami Forest, subject to complying with wood supply commitments.

2.2.2.1.1.1 Wood Supply Commitments

On the Nagagami Forest there is one active wood supply commitment (source: Available Wood Report, 2018-04-11). Of note, this information does not include any commitments which may be made through shareholder or other business to business agreements.

1) Levesque Plywood Limited in Hearst (owned by Columbia Forest Products). Species = poplar; fibre type (target) = merchantable (veneer); target volume = 33, 000 m3/year.

2.2.2.2 Overlapping Licenses and Forest Resource Licenses

For the recent period April 1, 2015 – August 1, 2019 there were six commercial forest resource licenses issued on the Nagagami Forest. Five of those were annual overlapping licenses issued to Levesque Plywood Limited/Columbia Forest Products. The one remaining was a CFSA exemption license issued to Hydro One Networks. During the same period there were 164 personal use licenses issued. This information was sourced from the MNRF TREES data warehouse on August 1, 2019.

2.2.2.3 Mill Utilization

Table 5 details the volume of wood that was harvested from the Nagagami Forest and processed at receiving mills for the period fiscal year (FY) 2009/10 – 2018/19. All hardwood was either birch or poplar (i.e. non-shade tolerant).

Table 5. Utilization of wood from the Nagagami Forest, FY2009/10 – 2018/19

Harvest Year	Processing Site Name	Wood Type	Volume (m^3)	Total Volume to Facility (m3)
2015/2016	Cyprien Lachance (Val Cote)	Softwood	107	107
2016/2017	Longlac Lumber Inc. (Longlac)	Softwood	1,575	1,575
2018/2019	Atlantic Power Corporation (Hearst)	Mixedwood	8,673	8,673
2010/2011	AV Terrace Bay Inc. (Terrace Bay)	Softwood	1,390	
2011/2012	AV Terrace Bay Inc. (Terrace Bay)	Softwood	593	
2012/2013	AV Terrace Bay Inc. (Terrace Bay)	Softwood	19,557	
2013/2014	AV Terrace Bay Inc. (Terrace Bay)	Softwood	15,108	
2014/2015	AV Terrace Bay Inc. (Terrace Bay)	Softwood	2,504	
2015/2016	AV Terrace Bay Inc. (Terrace Bay)	Softwood	11,158	
2017/2018	AV Terrace Bay Inc. (Terrace Bay)	Softwood	1,974	
2018/2019	AV Terrace Bay Inc. (Terrace Bay)	Softwood	15,710	67,994
2015/2016	EACOM Timber Corporation (Nairn Centre)	Softwood	6,924	
2016/2017	EACOM Timber Corporation (Nairn Centre)	Softwood	3,687	10,611
2009/2010	Hornepayne Lumber LP (Hornepayne)	Softwood	89,250	
2010/2011	Hornepayne Lumber LP (Hornepayne)	Softwood	172,965	
2011/2012	Hornepayne Lumber LP (Hornepayne)	Softwood	101,716	
2012/2013	Hornepayne Lumber LP (Hornepayne)	Softwood	153,335	
2013/2014	Hornepayne Lumber LP (Hornepayne)	Softwood	158,763	
2014/2015	Hornepayne Lumber LP (Hornepayne)	Softwood	142,941	
2015/2016	Hornepayne Lumber LP (Hornepayne)	Softwood	49,237	
2016/2017	Hornepayne Lumber LP (Hornepayne)	Softwood	82,288	
2017/2018	Hornepayne Lumber LP (Hornepayne)	Softwood	167,781	
2018/2019	Hornepayne Lumber LP (Hornepayne)	Softwood	207,463	1,325,740
2012/2013	Hornepayne Power Inc. (Hornepayne)	Mixedwood	7,773	
2013/2014	Hornepayne Power Inc. (Hornepayne)	Mixedwood	10,886	
2014/2015	Hornepayne Power Inc. (Hornepayne)	Mixedwood	32,248	
2015/2016	Hornepayne Power Inc. (Hornepayne)	Mixedwood	135,734	
2016/2017	Hornepayne Power Inc. (Hornepayne)	Mixedwood	111,899	
2017/2018	Hornepayne Power Inc. (Hornepayne)	Mixedwood	54,052	
2018/2019	Hornepayne Power Inc. (Hornepayne)	Mixedwood	39,023	391,614
2009/2010	Levesque Plywood Limited (Hearst)	Hardwood	12,491	

Harvest Year	Processing Site Name	Wood Type	Volume (m^3)	Total Volume to Facility (m3)
2010/2011	Levesque Plywood Limited (Hearst)	Hardwood	26,444	
2011/2012	Levesque Plywood Limited (Hearst)	Hardwood	14,623	
2012/2013	Levesque Plywood Limited (Hearst)	Hardwood	31,895	
2013/2014	Levesque Plywood Limited (Hearst)	Hardwood	17,750	
2014/2015	Levesque Plywood Limited (Hearst)	Hardwood	12,345	
2015/2016	Levesque Plywood Limited (Hearst)	Hardwood	8,372	
2016/2017	Levesque Plywood Limited (Hearst)	Hardwood	13,645	
2017/2018	Levesque Plywood Limited (Hearst)	Hardwood	20,057	
2018/2019	Levesque Plywood Limited (Hearst)	Hardwood	18,453	176,077
2015/2016	White River Forest Products Ltd. (White River)	Softwood	7,766	
2016/2017	White River Forest Products Ltd. (White River)	Softwood	27,214	
2018/2019	White River Forest Products Ltd. (White River)	Softwood	10,886	45,865

Source: TREES Data Warehouse - 2019-08-01

2.2.2.3.1 Destination of Sawmill Residues

The following facilities received residues from the Hornepayne mill between 2007 and 2017 (source: eFAR, 2018-04-23). However, due to the temporary closure of the Hornepayne Mill (detailed below), no data was reported past 2011-12.

- Resolute FP Canada Inc. (Thunder Bay and Iroquois Falls mills)
- Marathon Pulp Inc. (Marathon)
- Atlantic Power Corporation (Hearst)
- Flakeboard Company Ltd. (Sault Ste. Marie)
- Tembec Industries Inc. (Kapuskasing)
- Panolam Industries Inc. (Huntsville)
- Uniboard Canada Inc.
- St. Marys Paper Corp.
- AV Terrace Bay Inc. (Terrace Bay)

2.2.2.3.2 Forest Industry Profiles

Below is a description of the forest resource processing facilities actively receiving significant volume from the Nagagami Forest in any form. Forest industry had a 50% survey request response rate.

<u>Hornepayne Lumber</u>

As detailed in the 2017-18 Nagagami Forest Annual Report (year 7): In July 2006, the Hornepayne sawmill, at that time under ownership of Olav Haavaldsrud Timber Company, suffered from a fire resulting in the idling of the sawmill while repairs could be made. The sawmill successfully restarted in March 2007, a time of prolonged depressed softwood markets, which contributed to the Haavaldsrud sawmill suspending operations in November 2015 and going into receivership in April 2016. In August 2016, the sawmill was sold to and reopened by Hornepayne Lumber GP Inc. As per local knowledge, the mill produces spruce, pine, and fir (SPF) dimensional lumber.

According to the company's survey response, the mill has 10 woodlands employees, approximately 50 bush contractors and 92 mill/admin employees. Recent upgrades include the installation of an

autograder and upgrading of log decks - a $3 million investment. With these improvements and further anticipated automation upgrades, the mill hopes to see a production capacity increase of 40% over the next ten years. Lastly, the destination of mill products is split at roughly 66% to Ontario and 33% to the U.S.

Hornepayne Power Inc.

As detailed in the 2017-18 Nagagami Forest Annual Report (year 7): In February 2016, Becker Co-Generation, the owner of the facility, filed for protection from its creditors under the Companies' Creditors Arrangement Act (CCAA). Becker Co-Generation filed under the CCAA to devise a restructuring plan and avoid going into receivership or bankruptcy. Subsequently, in September 2016 the Co-Generation facility was sold and is now called Hornepayne Power Inc. The co-generation facility consumes SPF biomass (i.e. bark and sawdust) residues from the sawmill and all species biomass (e.g. whole tree, tops) from operations on the Nagagami Forest.

AV Terrace Bay

As detailed in the 2017-18 Nagagami Forest Annual Report (year 7): Terrace Bay Pulp Ltd. closed in March 2009 due to the global economic downturn and was subsequently purchased by Aditya Birla Group and restarted in October 2012 as AV Terrace Bay. According to the company website, it is a northern bleached softwood kraft pulp mill with annual production over 330,000 tonnes. The mill employs ~360 peoples and has invested ~$130 million invested over the last three years. Additionally, a news release on September 12, 2019 detailed that the mill supports 375 jobs in forestry operations that provide fibre, and that there were at that time 20 job vacancies at the mill. As per local knowledge, the mill predominately consumes spruce, pine, and fir (SPF).

Levesque Plywood Limited

This Columbia Forest Products owned plywood mill is in the community of Hearst. According to the company's survey response and information provided in a neighbouring District's SED, the mill has 20 woodlands employees and 227 mill/admin employees. Recent upgrades include the installation of a new Meinan lathe in 2015 - a $15 million investment, and currently underway at an estimated cost of $16 million are new composer, patchman and dryer projects, with expectations of an associated production increase of 30%. The facility has experienced no change of ownership within the last 10 years and the only significant downtime within that period was due to the recession. Lastly, the destination of mill products is split at roughly 55% to Ontario and 45% to the U.S. As per local knowledge, the mill predominately consumes poplar and white birch.

White River Forest Products

As detailed in the 2017-18 White River Forest Annual Report (year 10): In June 2009 White River Forest Products Limited (WRFP) acquired the White River sawmill from Domtar and the White River Forest SFL #550399 was transferred to WRFP. The White River sawmill was subsequently restarted in October 2013. In 2016, WRFP reorganised itself as a Limited Partnership and the SFL was transferred to WRFP LP. WRFP LP is composed of WRC Timber Inc., White River Development Corporation, Pic Mobert Sawmill Corporation, 3762165 Canada Inc. and White River Forest Products GP Inc. In 2018 the SFL was transferred to the Nawiinginokiima Forest Management Corporation (NFMC) with mill ownership

remaining with WRFP LP. As per local knowledge, the mill produces spruce, pine, and fir (SPF) dimensional lumber.

2.2.2.3.3 Crown Timber Charges Payment

The Provincial government collects Crown dues from forestry operations in the form of the Forest Renewal Trust (FRT), Forestry Futures Trust (FFT) and Stumpage. Table 6 details the dues paid from the Nagagami Forest from 2007-2017.

Table 6. Ten-year summary of actual harvest volume, value of stumpage, and the average stumpage paid through payments to the Forest Renewal Trust (FRT) and Forestry Futures Trust (FFT) for the Nagagami Forest

Year	Actual Harvest Volume (m^3)	Total Stumpage	Payments to FRT	Payments to FFT	Average Crown Timber Charges ($/$m^3$)
2007-08	324,991	$914,636	$1,116,346	$415,840	$7.53
2008-09	271,676	$723,088	$964,558	$355,939	$7.52
2009-10	102,304	$280,302	$355,146	$130,243	$7.48
2010-11	201,357	$574,661	$694,225	$217,356	$7.38
2011-12	117,433	$312,474	$412,251	$138,809	$7.35
2012-13	212,989	$1,829	$742,488	$338,003	$5.08
2013-14	203,252	$2,356	$794,357	$281,782	$5.31
2014-15	189,891	$2,450	$839,455	$228,998	$5.64
2015-16	219,882	$1,631	$517,210	$314,197	$3.79
2016-17	228,429	$939	$698,093	$239,749	$4.11

Source: TREES Data Warehouse - 2018-04-11
Note:
1/ Actual Volume includes undersized volume.
2/ Stumpage consists of minimum stumpage, residual value and administrative fees.
3/ Forestry Futures consists of Forest Futures Trust, FRI charges and forest management fees (No Forest Management Fees are recorded in TREES for the MU during this period).

2.2.2.4 Recreation and Tourism

2.2.2.4.1 Provincial Parks and Conservation Reserves

The Nagagamisis and Nagagami Lake Park addition link the Nagagamisis and Nagagami Lake Provincial Parks and provide 2,700 hectares of parkland at the north end of the unit. As well, the Pichogen River Mixed Forest Provincial Park lies partly within the Nagagami Forest and occupies an area on the eastern edge totaling 332 hectares. Lastly, the southeast portion of the unit contains a portion of the Chapleau Crown Game Preserve totaling 18,000 hectares.

2.2.2.4.2 Tourism

Commercial tourism is an important economic activity on the Nagagami Forest with a long and successful business history, as evidenced by the 24 active designated remote tourism lakes within the forest boundary.

As detailed in the four remote commercial tourism survey responses received (21% response rate), the average client volume over the past five years was reported as 500 (x2), 400 and 120. During that

period, two business had a roughly 40:60 Ontario/USA client home location ratio, one had 30:70 and one had 5:95. Guest capacity was reported as 22, 30, 40 and 55. All four businesses are three season operations (winter excluded), with full time seasonal employment of nine, five and two and one person(s) respectively. The primary activities offered include canoeing, hunting, and angling. All respondents intend on investing back into their business in the ten years, largely via accommodation and service upgrades, with one intending on exploring winter operations, including offering ice fishing.

In addition to the survey responses, it was recommended by one of the LCC planning team representatives that this section of the FMP reference the results of a 53 page study released in 2016 by CBRE Tourism and Leisure Group titled "North Algoma Resource Based Remote Tourism Operators Study", available online here: https://destinationnorthernontario.ca/resources/2016-north-algoma-resource-based-remote-tourism-operators-study/. The study area is confined to MNRF's Wawa District, and is therefore broader than the Nagagami Forest, however Figure 2 within indicates that Hornepayne is the nearest town to 13% of the remote tourism businesses that took part.

Numerous members of the planning team have read and understand the study. Because of its length and the variety of aspects of the remote tourism business that it investigates, to do it justice, reading the original document is recommended. If the above link is not functional, please contact the Wawa District MNRF for a copy.

The following excerpt summarizes the results, emphasis added: "In 2015, these 16 resource-based tourism operators (those operators who took part in the study) generated $8.4 million in revenues over a 140 day operating season, which translates into province-wide GDP generation of $7 million in direct, and indirect impacts, with 97% ($6.7 million) retained in Algoma District. On a direct and indirect basis, these operations support 164 jobs in Ontario (140 jobs in Algoma District), through generating salaries and wages of $3.8 million across the province. Furthermore, North Algoma's resource-based remote tourist lodges, outposts and air charter services benefit all levels of government, with 99% of Ontario's total direct taxes ($1.5 million) benefiting Algoma District.

The value of incremental visitor spending on communities within Algoma District is more difficult to quantify. As identified by the respondents, about 90% of visitors stay overnight in White River or Wawa on the way to and from the host lodge or outpost. At 6,887 guests staying at participating lodges and outposts in 2015, this equates to about 6,200 visitors spending money on accommodations, food and other supplies in surrounding communities. Assuming guests spend an additional night in White River or Wawa before flying into the remote lodge at an average spend of $100 per person, this equates to an estimated $625,000 in additional spending by remote lodge guests at the local community level."

2.2.2.5 Mining, Aggregate and Hydro Generation

The forest has numerous mining claims scattered throughout and exploration efforts are ongoing, but there are no large, active mining operations. Eleven surveys were sent to active mining claim holders and no responses were received.

The only hydrogeneration facility is the previously described Hornepayne Power Inc. co-gen facility that burns hog fuel to create electricity. It helps power the neighboring Hornepayne Lumber mill and contributes to the Ontario power grid.

According to Land Information Ontario, there are 30 active aggregate permits on the forest, consisting of 28 pits, one quarry, and one pit/quarry, in all covering roughly 202 hectares. According to the three survey replies (50% response rate), aggregate uses include municipal infrastructure repair and civil construction, with the latter producing an approximate average revenue of $100, 000/year.

2.2.2.6 Traplines, Baitfish and Other

The forest at least partially contains 37 bear management areas (13 vacant), managed by 16 operators; 31 trap lines (one vacant), managed by 49 licensed trappers; and 32 bait harvest areas (two vacant), managed by nine operators.

Bear management area operators are typically in the commercial bear hunt business. And according to their survey replies, clientele on the Nagagami Forest come almost exclusively from the U.S., with no Canadian clients and one European recorded over the past five years, with an average of 30 clients/year across the three respondents (18% response rate).

Three trappers replied to the survey request (10% response rate). All three rely on Crown roads to carry out the requirements of their license and most of their pelts/furs go to dealers for sale. The factors listed as impacting their ability to meet quotas are lack of animals, particularly martin, and too much timber harvest. However, the trapper who expressed concern about the level of timber harvest is confident their trapping prospects will improve over the next ten years as the jack pine tree plant in their area ages.

2.3 First Nation and Métis Background Information Report

The First Nation and Métis Background Information Report provides an opportunity for each participating First Nation and Métis community to share information regarding past and current use of natural resources (hunting, fishing, trapping, and gathering) on the Nagagami Forest. Also included, are forest management related issues and a description of natural resource features, land uses and values which are used by, or of importance to the community. The seven First Nation and Métis communities with an interest in the Nagagami Forest are:

- Brunswick House First Nation
- Biigtigong Nishnaabeg (Ojibways of the Pic River)
- Constance Lake First Nation
- Ginoogaming First Nation
- Métis Nation of Ontario
- Pic Mobert First Nation
- Red Sky Métis Independent Nation

Please refer to Supplementary Documentation Section 6.1 (c) to attain the full First Nation and Métis Background Information Reports.

3.0 DEVELOPMENT OF THE LONG-TERM MANAGEMENT DIRECTION

3.1 Introduction

This section describes the long-term management direction (LTMD) and the development of the management strategy. The long-term management direction provides direction for road access, harvest, renewal, and tending activities required for a balanced achievement of management objectives. During the development of the LTMD, management objectives and their desirable and target levels were identified through scoping analysis, which involved the use of the Strategic Forest Management Model (SFMM). The Ontario Landscape Tool (OLT) was also used to evaluate ecological and habitat indicators of forest composition and landscape pattern.

A management strategy was developed based on the evaluation and assessments of objective achievement balanced over the 150-year planning horizon. The management strategy sets the level of harvest for the 10-year period of the Forest Management Plan based on the results of a wood supply analysis and assessment of objective achievement. The wood supply analysis determines the available harvest area (AHA) for each forest unit.

The LTMD is developed using the following steps:

1) *Gathering background information*
2) *Identifying the current forest condition*
3) *Establishing a base model*
4) *Reviewing the desired forest and benefits*
5) *Developing management objectives*
6) *Proposing primary road corridors*
7) *Proposing and endorsing a long-term management strategy*

The LTMD must be consistent with forest legislation and policy and consider the direction in MNRF's forest management guides. The management strategy must also provide for an acceptable balance between social, economic, and environmental considerations noted above and provide for the sustainability of the Crown forest.

3.2 Management Considerations

Management considerations are developed from an evaluation of changes to the forest condition (e.g. significant natural disturbance) or social, economic, or environmental concerns that affect the development of the LTMD. The management considerations for the 2021 FMP were derived from multiple sources including insights gained during the implementation of the 2011 FMP, new science and policy direction, consultation with First Nation and Métis communities and topics raised by the LCC. These insights, including updated perspectives and deficiencies within the current FMP were identified at the Desired Forest and Benefits meetings (see section 3.4) are discussed in detail below.

3.2.1 Woodland Caribou (Boreal)

The woodland caribou (Boreal) is classified as a threatened species at both the federal and provincial levels. The species has very specific habitat requirements and therefore forest management plans have specific requirements to meet for approval. To provide adequate habitat, the entire forest cover mosaic must be manipulated in a specific sequence (i.e. through time) and orientation (i.e. across the landscape) to ensure sufficient habitat is provided throughout the planning horizon. The direction contained within the stand and site guide and the landscape guide provided the direction during the development of the LTMD to ensure provision of sufficient habitat for caribou and other species at risk.

Large landscape patches (LLP) have been developed to meet provincial targets for woodland caribou. The direction in the Boreal Landscape Guide builds upon and supports the priorities of Ontario's Woodland Caribou Conservation Plan - CCP (MNRF, 2009). The Nagagami Forest contains two distinct caribou zones comprised of the Continuous Distribution and Discontinuous Distribution Zones. As per CCP direction, the Discontinuous zone will not be managed broadly for caribou habitat to support self-sustaining populations. Instead it will be managed with a focus on specific landscapes that may support temporary caribou occupancy or movement between the continuous range and Lake Superior. A travel corridor that expands beyond the Nagagami Forest has been identified to provide connectivity between the Northern Caribou population and the Southern Coastal Lake Superior population. The placement of this corridor on the Nagagami Forest aligns seamlessly with the portions of the corridor already established in the Pic and White River Forest Management Plans.

As directed by the CPP, the development of a dynamic caribou habitat schedule (DCHS) has been established for the continuous caribou distribution zone found on the most northern tip of the Nagagami Forest. This schedule considers both current and future woodland caribou habitat needs and reflects natural forest conditions and dynamics. An adequate supply of caribou habitat has been maintained by setting minimum and maximum limits for the amount and distribution of habitat available over time. An uninterrupted supply of year-round caribou habitat within the limits of natural forest variability has been established with consideration to the influence of both forest harvesting and wildfire.

3.2.2 Enhanced Forest Resource Inventory

A new, enhanced FRI (eFRI) was used in the development of the 2021 FMP. This inventory effectively replaces the 1990 inventory used to develop previous plans, including the 2011 FMP, and presents a more recent snapshot of the forest, with additional information useful for forest management planning. The eFRI is based on digital airborne imagery which was captured in 2008. The photo interpretation of the imagery took place over several years and the eFRI layer was made available on the Lands Information Ontario (LIO) warehouse on September 6, 2017. The eFRI was used as the basis for developing the Planning Composite Inventory (PCI) and Base Model Inventory (BMI). Coupled with high-resolution imagery, the eFRI provided the Planning Team with a significantly improved starting point for developing the 2021 FMP, in both strategic and operational planning stages.

3.2.3 New Area of Concern Prescription and Conditions on Regular Operations

The planning team has used the most current MNRF direction to develop updated area of concern (AOC) prescriptions and conditions on regular operations (CROs) for known SAR occurrences on the forest. New AOC prescriptions or CROs will be developed and amended to the FMP if new SAR habitat or species occurrences that will potentially be impacted by planned forest operations are identified during plan implementation.

3.2.4 Age Class Structure

The age class structure of the Nagagami forest is an important consideration in the creation of the Nagagami Forest LTMD. The harvest levels (present and future) and habitat conditions are strongly influenced by the current distribution of seral stages and has a considerable effect on wood supply (present and future).

3.2.5 Timing of Forest Management Operations

There are several resource-based related activities that occur on the Nagagami Forest at any given time. In the past, forest operations avoided contentious areas due to potential conflicts with other users of the forest. Today, forest operations are increasingly found to be in direct conflict with other users and stakeholders. Forest practitioners continue to work with these stakeholders to lessen the impacts of forest operations. To address either the economic, social or environmental concerns from other users, forest operations are often rescheduled outside of the peak of the season (most often summer). Consequently, this means operating in these areas in the winter months, when normally they would be considered summer operating conditions. During the development of the 2021 FMP, HPL significantly increased its communication and information sharing to improve the coordination of forest operations with the resource-based tourism outfitters. The Areas of Concern which pertain to timing restrictions were reviewed and updated during the development of the 2021 FMP.

3.2.6 Climate Change

Climate change was an important consideration during the development of the FMP and identified by the local communities as concern during the desired and forest benefits meeting (see section 3.4). Forest management inherently provides an important role in potential mitigation of climate change through the sequestration of carbon in the accumulation of biomass and wood products. The planning team's approach to addressing climate change, however, was to focus on management activities, above and beyond regular forestry practices that will enhance the resiliency of the forest to a changing climate. This involved the development of a management objective to consider emerging climate change science and policy initiatives during plan development and implementation. The associated target includes implementing MNRF's Seed Transfer Policy, allowing for seedling production to be sourced from identified seed zones in anticipation of a future changed climate.

During the development of the 2021 FMP, multiple studies from peer-reviewed scientific journals concluded that 97% of all publishing climate scientists agree that the climate warming trend over the past 100 years is likely due to anthropogenic causes. Internationally, scientific organizations (academic, government, scientific associations, academies, and societies) are publicly on-record endorsing this position. Scientific consensus is clear that a continued anthropogenic increase of greenhouse gases will have serious social and economic consequences for the world's population and will result in changes in the existing terrestrial, aquatic and atmospheric systems that humans rely upon. While global surface temperatures are known to be generally rising, predicting climate change and its impacts on ecological systems, particularly at a local level remains very difficult and therefore has become a focus scientific study. The projected impacts of different climate change scenarios on forest health are being studied and include forest fire frequency and intensity, invasive species, forest pests and diseases, variability in precipitation (i.e. drought vs. increased rainfall), soil and species (flora and fauna). Climate change (vs weather) implies large scale impacts and therefore our perspective in forest management planning must not only be local in scope but extend to large-scale ecological-systems. Local forest management planning initiatives intended to address forest diversity and health and future forest resiliency to a changing climate must be based on scientific principles and rigour and contribute to the larger scientific knowledgebase. A well-meaning, but mis-informed local initiative (i.e. a silo approach) will rely on luck for success and perhaps more importantly, its failure will contribute nothing to our understanding of climate change.

Forest management efforts on the Nagagami forest will be coordinated, monitored, and evaluated to contribute to larger scientific data sets and knowledge.

It is likely that during the 10-year term of the plan, advances in climate science will lead to new avenues of study and forest policy change. Local managers may be compelled to assess forest health in new, and perhaps unanticipated, ways. New technology advancements in remote sensing will undoubtedly be a large part of future forest change monitoring and assessment. Specific management practices such as silviculture treatments, species selection and modification of rotation cycles may evolve to enhance forest carbon stocks and ensure a resilient forest. These same practices, including the location, size and orientation of future harvest areas and renewal treatments will also likely contribute significantly to northern forest community resilience, particularly in the context of forest fire. Area of concern planning, current and future wildlife habitat, and protected area planning all will require constant change as knowledge is implemented in forest management plans. Forest management policy, planning and operational implementation, therefore, will have to become flexible and able to incorporate up to date information from climate science as well as be informed by Indigenous knowledge systems. It is anticipated that policy makers and forest managers will collaborate with municipalities and First Nations when developing action plans to address projected future impacts of more frequent and severe weather events such as forest fires or ice storms.

3.2.7 Boreal Landscape Guide

The management objectives developed for this ten-year plan will be monitored and evaluated during various stages of plan development and implementation. Objective monitoring is key in assessing the progress towards implementing sustainable forest management on the Nagagami Forest. The analysis

package describes how the management objectives have influenced all decisions towards developing the strategic long-term management direction. One overarching objective is to direct forest management activities to maintain or enhance natural landscape structure, composition, texture, and patch size to provide for the long-term health of forest ecosystems and their associated wildlife species that is derived from the Boreal Landscape Guide. Key indicators for these landscape-scale habitat requirements, such as young forest patch size, mature and old forest etc., have been identified and projected in the model to 150 years into the future. A full suite of management objectives, indicators, targets, and the timing of assessment for each management objective can be found in Table FMP-10.

3.3 Base Model

Assumptions are used in the development of the base model inventory and base model. These assumptions are associated with the land base (including land use decisions), forest dynamics (including forest succession, growth and yield and post renewal forest succession), available silvicultural options and biological limits. The analysis for the LTMD was completed using the Strategic Forest Management Model (SFMM) software. To create the base model inventory (BMI), the planning inventory was updated to account for stand conditions that would be expected at plan start (i.e., stand age and forecast depletions).The BMI serves as the primary input for the base model (in SFMM), which includes assumptions related to the landbase, forest dynamics, available silvicultural options, biological limits, and other model assumptions identified by the planning team (Section 3.0 analysis package). The base model serves as a management decision support system that guides the development of the LTMD. A detailed description of the process required to create the base model is provided in section 6.1 (b) of the Supplementary Documentation.

3.3.1 Analysis of Silvicultural Activities

The analysis of past silviculture activities was performed by a Registered Professional Forester and informs the development of modeled yield curves and post renewal transition rulesets. This analysis utilized the trend analysis for the 2017 IFA and it also used the annual reporting and free-to-grow data (up to 2017) to provide insight into the success of silviculture treatments applied in the current and past FMPs. This involved a review of planned compared to actual renewal activities and expenditures, and their past performance (which is further discussed in section 3.3.2).

The post-renewal response was calculated by forest unit and treatment type from the free-to-grow data. The resulting response pathways were reviewed by the modelling and analysis task team and compared to the pathways used in the 2011 FMP. The results of this comparison and current regional policy direction served as the basis to create the post harvest renewal transition rules. The post harvest renewal transition rules for the 2021 FMP are documented in table FMP-5.

3.3.2 Analysis of Past Silvicultural Performance

An analysis of past silvicultural performance was conducted to support the development of post-harvest renewal transition rules. It is important that the assumptions regarding post renewal transitions are accurately reflected in the model, as the forecasted habitat condition and wood supply

are highly dependent on the transition of one forest unit to another following harvest. To ensure these assumptions are as accurate as possible, annual report data was compiled to provide insight into the success of past silviculture treatments applied over previous plan periods. Unfortunately, these data were inconsistently reported between and within previous FMPs, making it challenging to evaluate regeneration success accurately. To address this, the MATT team decided to derive the post-renewal transition rules sets from the free-to-grow data.

This process highlighted several instances where the free-to-grow regeneration results deviated considerably from the destination forest unit proportions forecasted in the development information of some SGRs. Some of the more significant examples include:

MW2-121-SP1: Full plant of MW2 targeting SP1 was expected to transition to SP1 85% of the time. FTG data indicate this transition only had a 15% success rate.

PJ1 - 021 - PJ1: Full plant of PJ1 targeting PJ1 was expected to transition to return to PJ1 85% of the time. FTG data indicate this transition only had a 22% success rate.

PJ2-010-PJ1: Full plant of PJ2 targeting PJ1 was expected to transition to return to PJ1 40% of the time and transition to PJ2 40% of the time. FTG data indicate the success rates of these transitions were 6% and 11%, respectively. This treatment primarily transitioned to SP1 (50%).

The samples size varied widely across all silvicultural strata within the free-to-grow dataset, therefore professional judgement was applied during analysis of the results. To mitigate against inaccurate conclusions resulting from a small sample size, the following additional sources of direction and empirical datasets were analyzed/considered in the development of the post renewal transition rule sets (FMP-5):

- Results from relevant silvicultural treatment packages achieved on the Nagagami Forest
- Post-renewal transitions from relevant adjacent forest Management Units with similar ecosite and treatment combinations
- 2016 NE Post-Renewal Forest Succession paper – Ken Lennon
- Post-Renewal succession rules from the approved 2011-21 Nagagami FMP

3.4 Desired Forest and Benefits

The desired forest and benefits are a description of the future forest structure, composition, goods, and services which are desired from the forest to achieve a balance of social, economic, and environmental needs over time.

The Planning Team, The Nagagami Local Citizens Committee, remote tourism operators, and other alternate representatives participated in the development of the desired forest and benefits for the 2021-2031 Nagagami FMP. The desired forest and benefits meeting was held on June 6, 2019 in the town of Hornepayne. This meeting served as a forum for the abovementioned parties to provide input

into refining the previous desired future forest condition and the associated benefits derived from the forest from the previous FMP process. The meetings also presented the opportunity for participating members to understand other opinions, and expectations for the FMP. The result was an appreciation of the range, and often conflicting, perspectives of the participants and an enhanced appreciation of the complexity in attaining a balanced achievement of objective. In total, 35 pieces of input were provided from the 21 attendees based on the FMPM-prescribed objective groupings (forest diversity cover: 8; Silviculture: 15 ; Socio economic: 12). This input was used to inform the adjustment of previous management objectives and associated indicators, targets, and desired levels or lead to the creation of new 2021 FMP objectives.

The planning team considered all input provided from the meeting. Some material could not be considered in the objective suite since they were adjudicated as outside the scope of forest management planning.

Refer to the summary of public consultation 6.1(k) Supplementary Documentation for further detail on the Desired Forest and Benefits Meeting.

3.5 Strategic Management Zones

Strategic Management Zones (SMZs) are geographical areas within a management unit that provide spatial context when preparing the LTMD or planning proposed operations. The Nagagami Forest is divided into 6 strategic management zones.

Table 7, Strategic Management Zones

SFMM Name	***Description***
MAIN	*Primary subunit of the management unit, represents all areas that are not within the DCHS or the Discontinuous corridor.*
A_SMZ	*'A' blocks (online for 2011-31) of the Dynamic Caribou Habitat Schedule*
B_SMZ	*'A' blocks (online for 2031-51) of the Dynamic Caribou Habitat Schedule*
C_SMZ	*'A' blocks (online for 2051-71) of the Dynamic Caribou Habitat Schedule*
D_SMZ	*'A' blocks (online for 2071-91) of the Dynamic Caribou Habitat Schedule*
DISCON	*The discontinuous caribou corridor*

Dynamic Caribou Habitat Schedule (DCHS)

The goal of the Caribou Conservation Plan is to maintain self-sustaining, genetically-connected local populations of woodland caribou (forest-dwelling boreal population) where they currently exist, strengthen security and connections among isolated mainland local populations, and facilitate the return of caribou to strategic areas near their current extent of occurrence. Ontario will provide for and renew caribou habitat during forest management planning by requiring the development of a "*dynamic caribou habitat schedule*" for each forest management plan. These schedules will be developed for and integrated across all forest management plans within continuous caribou distribution.

The Nagagami forest overlaps a very small portion of the Pagwachuan Caribou Range located in northeastern Ontario and is approximately 45, 000 km^2 in size. The southern boundary of the range is

immediately north of Hearst and Kapuskasing, and the town of Longlac is situated along the western boundary. It represents the land area between the Nipigon Range, the Kesagami Range, and is south of the Missisa and James Bay ranges of the Far North. The range includes the eastern edge of the Kenogami Forest, the northern portion of the Big Pic Forest, the northern tip of the Nagagami Forest, and northern portions of the Hearst Forest and Gordon Cosens Forest. Harvest of these areas will be sequenced in a manner that provides the appropriate quantity of caribou habitat in this zone over the planning horizon. These zones were created for the 2011-2021 FMP and were adopted without change into the 2021-2031 FMP.

Discontinuous caribou corridor

This corridor aligns with the travel corridor initiated on the Pic Forest and the White River Forest. Establishment of the corridor dimensions was based on landscape features (i.e. water courses and waterbodies) and area of three mature conifer landscape classes present.

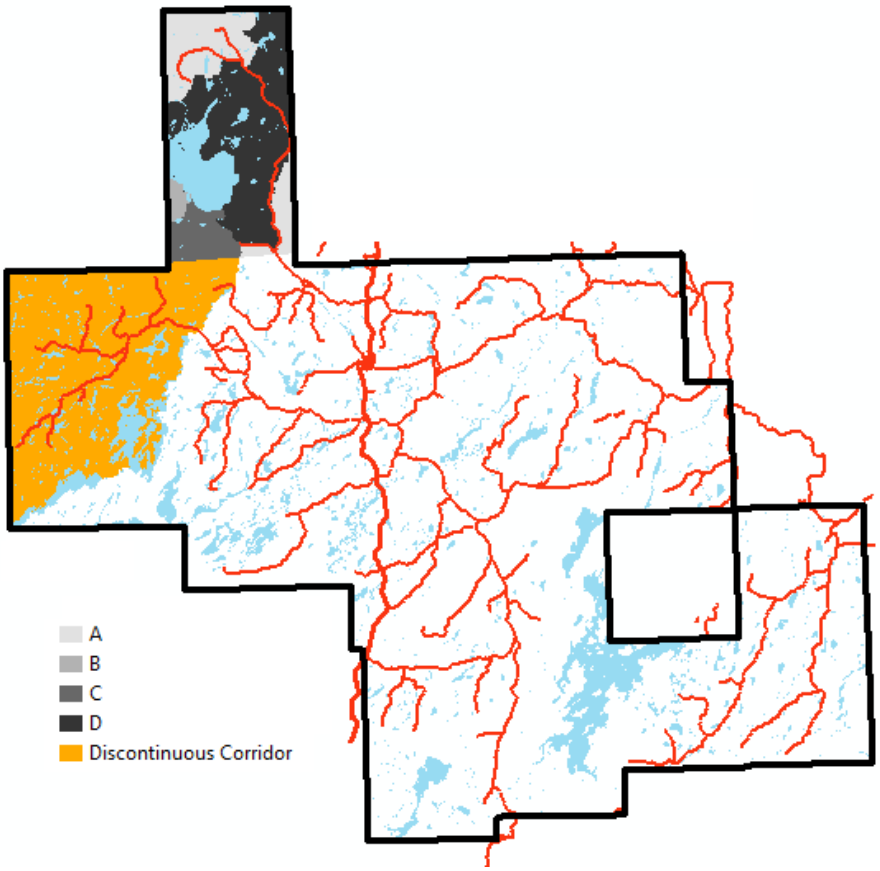


Figure 4, Strategic Management Zones (SMZ) on the Nagagami Forest.

3.6 Objectives and Indicators

This section will describe the suite of management objectives including the associated indicators and the timeline for indicator assessment. For each indicator, the planning team has developed desirable levels and targets by considering the background information, management guide direction, desired forest and benefits meeting results, the local Citizens Committee and the results of scoping analysis.

Objective development was also guided by MNRF sources of direction, including Figure A-3 from the Forest Management Planning Manual for Ontario's Crown Forests (MNRF 2017) and from the forest management guides, particularly the Forest Management Guide for Boreal Landscapes and the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales. For each objective grouping the management objectives, associated indicators, desirable levels and targets, and the timing of assessment is described in detail below and summarized in Table FMP-10.

The primary goal of a forest management plan is to achieve a healthy, sustainable forest ecosystem, which is vital to the well-being of forest based, and non-forest based, Ontario communities.

The CFSA directs that all management objectives, and their associated indicators developed for a forest management plan be compatible with one of four primary objective groupings. These groupings are as follows;

a) *Crown forest diversity objectives, including consideration for the conservation of natural landscape patterns, forest structure and composition, habitat for animal life and, the abundance and distribution of forest ecosystems,*
b) *Social and economic objectives, including harvest levels and a recognition that healthy forest ecosystems are vital to the well-being of Ontario communities*
c) *The provision of forest cover for those values that are dependent on the Crown forest*
d) *Silviculture objectives for the harvest, renewal, and maintenance of the Crown forest*

For each individual grouping there are one or more related objectives, with associated indicators, desirable levels, and targets. As shown above, forest management objectives are developed for benefits or outcomes that can be achieved by manipulating forest cover. The associated indicators for achieving these types of objectives will involve silvicultural methods for harvest, renewal and tending since these are the processes by which forest cover is manipulated. For each indicator, there are associated desirable levels and targets, measured either qualitatively or quantitatively with an associated timeline for assessment. The desirable level reflects the planning team's interpretation of the ideal condition without consideration for any other objective. Target establishment, on the other hand, reflects the necessity for balancing contrasting management objectives. This may result in targets that differ from the desired levels. The planning team developed targets using input from the local citizen's committee, First Nation and Métis community members and the planning team at the desired forest and benefits meetings. The target levels were supported by scoping analysis results using the SFMM. Target levels considered background information and relevant forest management guides including the Landscape Guide and Stand and Site Guide. Sections 4.0, 5.0, 6.0 of the Analysis Package describe in detail the inputs, results, and conclusions for the development of management objectives and scoping investigations.

The Forest Management Plan objectives are developed for benefits or outcomes that can be achieved by manipulating forest cover. Achieving these indicators will involve the application of silvicultural methods for harvest, renewal and tending as these are the processes by which forest cover is manipulated. In some cases, objectives are associated with multiple indicators of sustainability. Indicators are categorized as either quantitative (i.e. with specific measurable targets) or qualitative,

which are evaluated by ensuring specific criteria are met, but are not defined by specific amounts or numbers.

Several indicators have been assessed during the development of the long-term management direction and will be followed-up at later stages of plan production. The objectives and indicators that require measurement over medium- and long-term time scales were assessed using the Strategic Forest Management Model (SFMM) and balanced as part of the requirements of the management strategy. The Ontario Landscape Tool (OLT) was used to evaluate specific spatial and non-spatial indicators of landscape diversity at the start (2021) and end (2031) of the plan. The remaining objectives are assessed through the development of the FMP during Stage 3 and Stage 4 or during implementation of the FMP, in the Year 5 and 10 Annual Reports.

Some of the short-term objectives use compliance inspections as key indicators, which are measured as the percent of inspections in compliance. The desirable level for the percent of inspections would be 0% non-compliance for inspections related to all the following objectives. These levels were chosen to ensure that there is no impact of forest activities on the values and other stakeholders on the forest, however, it is unrealistic to expect zero instances of non-compliances, so the target level was set at (refer to FMP-10) >90% in compliance. These indicators will be tracked and monitored through the annual report and will be assessed at years 5 and 10.

3.6.1 Objectives and indicators

3.6.1.1 Management Objective 1 – Provide Caribou Habitat

Create a forest landscape condition that provides adequate amount and distribution of caribou habitat within the continuous and discontinuous caribou zones, consistent to the Boreal Landscape Guide's recommendations.

Background/Rationale:

Woodland caribou are threatened nationally and provincially. The CFSA (1994) and the FMPM (2017) requires provision of an adequate amount and distribution of caribou habitat through time. The standards and guidelines within the landscape guide and the caribou conservation plan (2015) were used to develop this management objective and its associated indicators. All indicators are quantitative, except 1.9. Target levels deviated slightly from desirable levels, as desirable levels were not achievable in all scenarios. Target levels, represent the maximum movement towards the desirable level, as recommended by the 2021-31 Modelling and Analysis Task Team (MATT) and approved by the planning team.

The Nagagami Forest overlaps the continuous and discontinuous caribou zones (as described in the CCP 2015). Both zones have different management objectives, the development of which is documented in the Supplementary Documentation, section 6.1 (b) Analysis Package and LTMD Development.

Source(s) of direction: CFSA, FMPM, Forest Management Guide for Boreal Landscapes (2014) and the Caribou Conservation Plan (2015).

3.6.1.1.1 Indicators:

Continuous zone - Area of winter suitable habitat (CAR_S)

- *Desired Level: 18,908 Ha - 22,238 Ha*
- *Target: Maintain between 18,908 Ha - 22,238 Ha*
- *Timing of Assessment: LTMD - Stage 2*

Continuous zone - Area of mature conifer (CAR_C)

- *Desired Level: 6,955 Ha - 11,836 Ha*
- *Target: Increase towards 6,955 Ha - 11,836 Ha*
- *Timing of Assessment: LTMD - Stage 2*

Continuous zone - Texture of caribou winter suitable habitat. (Proportion of 6000 hexagons in >=75% texture classes)

- *Desired Level: 0.48*
- *Target: Increase towards 0.48*
- *Timing of Assessment: LTMD, Proposed Ops, and Draft Plan.*

Continuous zone - Texture of caribou mature conifer habitat. (Prop. of 6k hexagons in >=28% texture classes))

- *Desired Level: 0.502*
- *Target: Increase towards 0.502*
- *Timing of Assessment: LTMD, Proposed Ops, and Draft Plan.*

Continuous zone - % successful regeneration to desired conifer forest unit for: PJ1, PJ2, SB1, SP1, LC1.

- *Desired Level: 100%*
- *Target: >=90% regeneration success*
- *Timing of Assessment: Year-10 Annual Report*

Continuous zone - Proportion of combined Pj, Sw, Sb in each of the pure conifer forest units

Desired Level: Maintain or increase the combined proportion of Pj, Sb, Sw in pure conifer forest units. Targets:

- *LC1 - 0.44*
- *PJ1 - 0.95*
- *PJ2 - 0.88*
- *SB1 - 0.87*
- *SP1 - 0.86*
- *Timing of Assessment: Year-10 Annual Report*

Continuous zone - Road densities of primary and branch roads): Kilometres of all-weather road per km^2 of Crown Forest

- *Desired Level: 0.145 km/km^2*
- *Target: maintain or decrease*
- *Timing of Assessment: Year-10 Annual Report*

Discontinuous zone (Travel Corridor) - % Area of Combined (MOLC, IOP, MOC)

- *Desired Level: 15,193 ha / 41,225.35 ha*
- *Target: Maintain desired level*
- *Timing of Assessment: LTMD, Proposed Operations, and Draft Plan.*

Discontinuous zone (Travel Corridor) Arrangement of harvest operations that that provides the opportunity for increasing the patch sizes of connected conifer forest units of similar age classes (Qualitative)

- *Desired Level: N/A*
- *Target: N/A*
- *Timing of Assessment: Proposed Operations and Draft Plan*
- *Discontinuous zone (Corridor) - Kilometers of SFL primary, branch, and operational roads per square kilometer (km/km^2)*
- *Desired Level: <= 0.97*
- *Target: Maintain or decrease*
- *Timing of Assessment: Year-10 Annual Report*

3.6.1.2 Management Objective 2 -Maintain or Enhance Properties of the Natural Forest Landscape

To direct forest management activities to maintain or enhance natural landscape structure, composition, texture, and patch size that provide for the long-term health of forest ecosystems and associated wildlife species by applying the Boreal Landscape Guide.

Background/Rationale: This management objective is a requirement of the CFSA (1994) and the FMPM (2017). All associated indicators are quantitative. The desired levels and target statements were derived from the standards and guidelines in the Forest Management Guide for Boreal Landscapes (2014). The spatial assessment (mature and old growth texture, young forest patch size), was completed using the Ontario Landscape Tool (OLT). Desirable levels were based on the each of the landscape guide Simulated Range of Natural Variation (SRNV) means. Target levels were based on the spatial assessment of preferred harvest area identified at stage 2 of the LTMD.

Source(s) of direction: CFSA, FMPM, Forest Management Guide for Boreal Landscapes (2014)

3.6.1.2.1 Indicators:

Area (ha) of immature and older pine (IOP):

- *Desired Level: 10,953 Ha - 22,378 Ha*
- *Target: Increase towards 10,953 Ha - 22,378 Ha*
- *Timing of Assessment: LTMD - Stage 2*

Area (ha) of immature and older hardwood and immature mixedwood (IOHIM):

- *Desired Level: 54,013 Ha - 76,670 Ha*
- *Target: Maintain within 54,013 Ha - 76,670 Ha*
- *Timing of Assessment: LTMD - Stage 2*

Area (ha) of mature and older mixedwood (MOM):

- *Desired Level: 35,212 ha - 52,522 ha*
- *Target: Increase towards 54,013 Ha - 76,670 Ha*
- *Timing of Assessment: LTMD - Stage 2*

Area (ha) of mature and older upland conifer (MOC):

- *Desired Level: 29,983 ha - 44,076 ha*
- *Target: Decrease towards 29,983 ha - 44,076 ha*
- *Timing of Assessment: LTMD - Stage 2*

Area (ha) of mature and older lowland conifer (MOLC):

- *Desired Level: 65,805 ha - 109,848 ha*
- *Target: Maintain within 65,805 ha - 109,848 ha*

- *Timing of Assessment: LTMD - Stage 2*

Area (ha) of old growth (LATE):

- *Desired Level: 73, 614 ha -100,255 ha*
- *Target: Decrease towards 73, 614 ha -100,255 ha*
- *Timing of Assessment: LTMD - Stage 2*
-

Area (ha) of Red and White Pine:

- *Desired Level: Increase above current level (46 ha)*
- *Target: Increase above current level (46 ha)*
- *Timing of Assessment: LTMD - Stage 2*

Area (ha) of Pine Conifer (P_CON):

- *Desired Level: 30,013 ha - 54,287 ha*
- *Target: Maintain within 30,013 ha - 54,287 ha*
- *Timing of Assessment: LTMD - Stage 2*

Area (ha) of Upland Conifer (U_CON):

- *Desired Level: 49,265 ha - 64,937 ha*
- *Target: Decrease towards 49,265 ha - 64,937 ha*
- *Timing of Assessment: LTMD - Stage 2*

2.10 Area (ha) of Lowland Conifer (L_CON):

- *Desired Level: 123,333 ha - 136,806 ha*
- *Target: Increase towards 123,333 ha - 136,806 ha*
- *Timing of Assessment: LTMD - Stage 2*

Area of Young Forest (YOUNG):

- *Desired Level: 39,365 ha - 80,141 ha*
- *Target: Increase towards 39,365 ha - 80,141 ha*
- *Timing of Assessment: LTMD - Stage 2*

Texture of Mature and Old Forest (500 ha scale frequency distribution):
Desired Levels:

- *0.01-0.20: 0.151*
- *0.21-0.40: 0.176*
- *0.41-0.60: 0.167*
- *0.61-0.80: 0.337*
- *>0.8: 0.170*

Targets:

- *0.01-0.20: Increase*
- *0.21-0.40: Decrease*
- *0.41-0.60: Decrease*
- *0.61-0.80: Increase*
- *>0.8: Increase*
- *Timing of Assessment: Final Plan*

Texture of Mature and Old Forest (5000 ha scale frequency distribution) *Desired Levels:*

- *0.01-0.20: 0.085*
- *0.21-0.40: 0.179*

- *0.41-0.60: 0.276*
- *0.61-0.80: 0.403*
- *>0.8: 0.057*

Targets:

- *0.01-0.20: Increase*
- *0.21-0.40: Decrease*
- *0.41-0.60: Decrease*
- *0.61-0.80: Increase*
- *>0.8: Increase*
- *Timing of Assessment: Final Plan*

Young Forest Patch size frequency distribution Desired Levels:

- *1-100: 0.610*
- *101-250: 0.147*
- *251-500: 0.074*
- *501-1,000: 0.050*
- *1,001-2,500: 0.041*
- *2,501-5,000: 0.024*
- *5,000-10,000: 0.021*
- *10,001-20000: 0.016*
- *>20,000: 0.017*

Targets:

- *1-100: increase towards desired*
- *101-250: decrease toward desired*
- *251-500: decrease toward desired*
- *501-1,000: Maintain current levels*
- *1,001-2,500: increase towards desired*
- *2,501-5,000: increase towards desired*
- *5,000-10,000: increase towards desired*
- *10,001-20000: increase towards desired*
- *>20,000: increase towards desired*
- *Timing of Assessment: Final Plan*

3.6.1.3 Management Objective 3 – Values Protection

To develop and implement forest activities in a manner that protects or enhances environmental, riparian, wildlife, recreational and cultural heritage values by applying the Stand and Site Guide.

Background/Rationale:
This management objective is a requirement of the CFSA (1994) and the FMPM. The standards and guidelines of the Stand and Site Guide were the basis for the development of this management objective and its associated indicators. Both indicators are quantitative.

Source(s) of direction: CFSA, FMPM, Stand and Site Guide, Forest Management Guide for Cultural Heritage Values (2007).

3.6.1.3.1 Indicators:

Level of compliance with AOC prescriptions described in the Stand and Site Guide and by activity type (Harvest, Access, Renewal, and Maintenance)

- Desired Level: 100%
- *Target: >=90% Compliance*
- *Timing of Assessment: Year -5 and Year -10 Annual reports*

Level of compliance with AOC prescriptions described in cultural heritage values protection guide:

- *Desired Level: 100%*
- *Target: >=90% Compliance*
- *Timing of Assessment: Year -5 and Year -10 Annual reports*

3.6.1.4 Management Objective 4 -Protect and Maintain Critical SAR habitat

To maintain, protect, or enhance where needed, critical habitat for species of special concern, threatened, and endangered species on the Nagagami Forest.

Background/Rationale: This management objective is a requirement of the CFSA (1994) and the FMPM. The standards and guidelines of the stand and site guide served as the backdrop for the development of this management objective and its associated indicator (quantitative).

Source(s) of direction: CFSA, FMPM, Stand and Site guide, Boreal Landscape guide

Indicator:

Level of compliance with prescriptions associated with habitat for species at risk

- *Desired Level: 100%*
- *Target: >=90% Compliance*
- *Timing of Assessment: Year-5 and Year-10 Annual Reports*

3.6.1.5 Management Objective 5 – Sustainable Wood Supply

To provide a sustainable, predictable, and economical supply of wood products that are required by wood processing mills dependent on the Nagagami Forest.

Background/Rationale: This management objective is a requirement of the CFSA (1994) and the FMPM and is intended to ensure the 2021-31 FMP satisfies the industrial wood requirement of the facilities that consume fiber from the Nagagami forest. All indicators are quantitative.

Source(s) of direction: CFSA and FMPM

3.6.1.5.1 Indicator(s):

Long-term projected Available Harvest Area Desired AND Target Levels:

- *BW1: 27 ha/year*
- *LC1: 406 ha/year*
- *MW1: 87 ha/year*
- *MW2: 7 ha/year*
- *PJ1: 71 ha/year*
- *PJ2: 843 ha/year*
- *PO1: 1045 ha/year*
- *PWR: N/A*
- *SB1: 231 ha/year*
- *SF1: 195 ha/year*
- *SP1: 597 ha/year*
- *Timing of Assessment: LTMD - Stage 2 and draft plan*
- Actual annual harvest area *Desired Levels for all PLANFUs: 100%*
- *Target Levels for all PLANFUs: >=90%*
- *Timing of Assessment: LTMD - stage 2 and draft plan*

Long-term projected available harvest volume by species group (10-year, m^3)
Desired and target Levels:

- *SPF: 2,400,000 m^3*
- *Ce: N/A*
- *La: 90,000 m^3*
- *Prw: N/A*
- *Po: 1,750,000 m^3*
- *Bw: 177,000 m^3*
- *Timing of Assessment: LTMD - Stage 2*
- Actual Annual harvest volume
- *Desired levels for all spp. groups: 100%*
- *Target levels for all spp. groups: TBD*
- *Timing of Assessment: Year-5 and Year-10 Annual Reports*

Long-term projected available harvest volume by broad size or product group
Desired Levels for all product groups: >= plan start levels
Target Levels:

- *Po Bw veneer: 236,605 m3*
- *Po Bw Other quality: 1,428,759 m^3*
- *SPF Sawlog: 2,007,684 m^3*
- *All other products: 730,486 m^3*
- *Timing of Assessment: LTMD - stage 2*
- Managed Crown forest available for timber production (ha)
- *Desired level: Maintain*
- *Target levels: Maintain*
- *Timing of Assessment: LTMD - Stage 2*

3.6.1.6 *Management Objective 6 – Adhere to Land Use Direction and Intent*

To moderate the effects of forest operations on road-based tourism, other recreational activities, mineral exploration, remote tourism, and other road based commercial activities by being consistent with the management intent of Crown Land Use Policy Atlas.

Background/rationale: This management objective was derived from the direction in the Crown Land Use Policy Atlas which provides land-use planning direction for forest management activities within remote tourism zones adjacent to designated remote tourism lakes. This management objective was present in the 2011 plan and reaffirmed at the 2021 desired forest and benefits meeting. Both indicators are considered quantitative.

Source(s) of direction: Crown Land Use Policy Atlas and Wawa District's Crown Land Use Atlas Harmonization Project

3.6.1.6.1 Indicators:

Compliance with AOC prescriptions that protect values related to road-based tourism, recreation, mineral exploration, and commercial activities

- *Desired level: 100%*
- *Target levels: 100%*
- *Timing of Assessment: Year-5 and Year-10 Annual Reports*

Kilometers of SFL primary, branch, and operational road per square kilometer of Crown forest (km/km^2):

- *Desired level: 1.1 km/km^2*
- *Target levels: 1.1 km/km^2*
- *Timing of Assessment: Year-5 and Year-10 Annual Reports*

3.6.1.7 Management Objective 7 – Protect Indigenous Values

To protect cultural heritage values, natural resource features and land use values which are specifically used by, or of importance to local Indigenous communities that may be affected by forest management.

Background/Rationale: This management objective is a requirement of the CFSA (1994) and the FMPM and is intended to ensure cultural heritage or indigenous values are given adequate protection.

Source(s) of direction: CFSA, FMPM, Forest Management Guide for Cultural Heritage Values (2007)

Indicator:

Compliance with AOC prescriptions relating to cultural heritage and Indigenous values

- Desired level: 100% compliance
- Target levels: >=90% compliance
- Timing of Assessment: Year-5 and Year-10 Annual Reports

3.6.1.8 Management Objective 8 – Encourage Participation in Forest Management Planning

To encourage participation of public, LCC and First Nations (or aboriginal) communities in the development of the Nagagami Forest 2021 FMP.

Background/rationale: This management objective is a requirement of the CFSA (1994) and the FMPM (2017) and is intended to encourage participation of LCC members and first nation communities during the planning process. All indicators are considered quantitative.

Source(s) of direction: CFSA and FMPM

3.6.1.8.1 Indicators:

Opportunities for involvement of First Nation and Métis communities in plan development:

- Desired level: That First Nation and Métis community members actively participate and offer input during the planning process for the 2021-31 Nagagami FMP.
- Target levels: That First Nation and Métis community members actively participate and offer input during the planning process for the 2021-31 Nagagami FMP.
- Timing of Assessment: Final Plan

Indigenous community's self-evaluation of its effectiveness in the plan development:

- Desired level: "That LCC members actively participate and offer input during the planning process and evaluate their effectiveness from: 1-"low" to 10 "" high"
- Target levels: That LCC members actively participate and offer input during the planning process and evaluate their effectiveness as 10 "high"
- Timing of Assessment: Final Plan

Participation of LCC members at LCC meetings during the FMP planning process:

- Desired level: "That LCC members actively participate and offer input during the planning process and evaluate their effectiveness from 1-"low" to 10 " high"
- Target levels: That LCC members actively participate and offer input during the planning process and evaluate their effectiveness as 10 " high"
- Timing of Assessment: Final Plan

Local citizens committee self-evaluation of its effectiveness in the plan development

- Desired level: "That the LCC participate in the planning process for the 2021-31 Nagagami FMP and evaluate their effectiveness from 1-"low" to 10 " high"
- Target levels: "That the LCC participate in the planning process for the 2021-31 Nagagami FMP and evaluate their effectiveness at 10 " high"
- Timing of Assessment: All Annual Reports, and year-5 and year-10 Annual Reports

3.6.1.9 Management Objective 9 – Meet Silviculture Objectives

To use appropriate silviculture treatments and harvest method (including CLAAG, aerial seeding, commercial thinning, prescribed burn) to achieve the target forest unit and yield and continue to be transparent in the location of herbicide application and its effects.

Background/rationale: Input from desired and forest benefits meeting indicated there was a desire to see alternatives to aerial herbicide implemented. The planning team developed management objective 9 to address this input. All indicators are quantitative, except 9.5.

Source(s) of direction: Planning team and Desired Forest and Benefits meeting

3.6.1.9.1 Indicators:

Percent of harvested forest area successfully established Plan Forest Unit (renewal success):

- *Desired level: 100% successful establishment*
- *Target levels: >=90% successful establishment*
- *Timing of Assessment: Year-5 and Year-10 Annual Reports*

Planned and actual percent of harvest area treated by silvicultural Strata:

- *Desired level: 100% of the planned treatments complete*
- *Target levels: >=90% of the planned treatments complete*
- *Timing of Assessment: Year-5 and Year-10 Annual Reports*

Planned and actual percent of area successfully regenerated to the target forest unit by forest unit:

- *Desired level: 100% regenerated to the target forest unit*
- *Target levels: >=90% regenerated to the target forest unit*
- *Timing of Assessment: Year-5 and Year-10 Annual Reports*

Establish benchmark number of hectares tended with aerial herbicide:

- *Desired level: TBD*
- *Target levels: TBD*

Timing of Assessment: Year-5 and Year-10 Annual Reports

- A thinning operation of the Pr plantation completed
- *Desired level: TBD*
- *Target levels: TBD*
- *Timing of Assessment: Year-5 and Year-10 Annual Reports*

3.6.1.10 Management Objective 10 – Increase Resiliency of the Forest

Ensure the preservation of the local gene pool in the present and future.

Background/rationale: This management objective was present in the 2011 plan and was reaffirmed based on input at the desired forest and benefits meeting. This management objective is intended to encourage a split between local and assisted migration seeds, with the goal of increasing resiliency to the effects of climate change.

Source(s) of direction: 2011 FMP, McKenney, D., Pedlar and O'Neill. March 2009. Climate change and forest seed zones: Past trends, prospects, and challenges to ponder. The Forestry Chronicle VOL 85.

3.6.1.10.1 Indicators:

Percentage of seedlings originating from improved seed orchards in seed zones 16 and 17 and assisted migration:

- *Desired Level: >0%*
- *Target Level: >0%*
- *Timing of Assessment: year-5 and year-10 Annual Reports*

Percentage of seedlings originating from seed zones 16 and 17 and assisted migration:

- *Desired Level: >0%*
- *Target Level: >0%*
- *Timing of Assessment: year-5 and year-10 Annual Reports*

3.6.1.11 Management Objective 11 – Road Safety

To maintain a reliable road network and facilitate effective interaction between snowmobile clubs to promote safety.

Background/rationale: It was identified at the desired forest and benefits meeting that there is not adequate communication between the local snow mobile club and forest industry, resulting in several near misses. This management objective is intended to prevent future near misses and collisions.
Source(s) of direction: Desired forest and Benefits Meeting

3.6.1.11.1 Indicators:

Schedule fall annual meetings between Hornepayne Lumber LP and the Snowmobile Club members:

- *Desired Level: 1 fall annual meeting*
- *Target Level: 1 fall annual meeting*
- *Timing of Assessment: All annual report including the year-5 and year-10 Annual Reports.*

3.6.1.12 Management Objective 12 – Herbicide Education

Seek an opportunity to demonstrate the effects of aerial herbicide application by comparing treated and untreated stands.

Background/rationale: This management objective was created to address input from the desired forest and benefits meeting to evaluate and potentially implement alternatives to aerial spray.

Source(s) of direction: Desired Forest and Benefit Meeting

3.6.1.12.1 Indicator:

Number of demonstration sites:

- *Desired Level: 1 site established*
- *Target Level: 1 site established*
- *Timing of Assessment: Plan End*

3.7 Long-Term Management Direction

As described earlier, the SFMM was used as the primary analysis tool for the strategic planning of this FMP. This computer model simulates the Nagagami Forest condition through time by projecting changes to the forest structure, composition, and age for 160 years into the future. The model also evaluates forested areas, for their contribution to forest diversity and timber production. The SFMM was used to determine the levels of forest management activities required to manage forest cover to balance the achievement levels for all the management objectives. The SFMM was also used in the development of achievable targets in the proposed long-term management direction. The model outputs include a description of the forest condition for the Crown productive forest, available harvest area by forest unit and available harvest volume by species group.

The planning team also utilized the Ontario Landscape Tool (OLT), which is a GIS-based landscape structured language (LSL) spatial model. This tool was used to evaluate and establish target levels for the development of this plan and for completing the spatial assessments that were conducted during the development of the LTMD. Detailed information on the development of inputs and the use of the SFMM for the preparation of the FMP can be found in in Section 4.0 of the Analysis Package.

The long-term management direction (LTMD) represents a balance in the achievement of management objectives, based on model analysis of what the forested land base can achieve under a variety of constraints. The product of this process is described in the following tables:

a) Forest condition for the Crown productive forest (FMP-6)
b) Habitat for selected wildlife species (FMP-7)
c) Available harvest area by forest unit (FMP-8)
d) Available harvest volume by species group, and broad size or product group (FMP-9)

Objectives related to forest cover and biodiversity were confirmed and updated according to new policy direction in the Landscape Guide and Stand and Site Guide. The landscape guide (2014) has replaced the 2011 FMP direction in the previous 'Natural Disturbance Pattern Emulation Guide'. While there are similarities between the two directional documents, the 2021 LTMD addresses many new and challenging landscape-level ecological indicators that the planning team must analyse, balance results, and then describe how each indicator progresses through time towards the simulated range of natural variation (SRNV).

An iterative process of modeling scenarios (i.e. Scoping analysis, per FMPM 2017) was conducted to provide insight into the potential for the forest to produce several benefits over time. Broadly, scoping investigations considered implications on wood supply, forest conditions, habitat, and other non-timber resources for the short-term, medium-term, and long-term. Refer to section 5 of the Analysis Package for further details. The results of the scoping analysis served as important context for the development of realistic and feasible desirable levels for objective indicators.

In accordance with the FMPM 2017, the setting of desired levels considered the following:

- An investigation into the ability of the forest to meet forest diversity and forest cover desirable levels (based on current forest condition and forest dynamics)
- An investigation and assessment of the ability of the forest to continue to supply forest benefit levels associated with the current FMP
- An investigation and assessment of the ability of the forest to supply the current industrial demand.

Desired levels may differ from target levels, as target levels can be unachievable in certain circumstances. Using SFMM as the decision support tool, the planning team determined a suite of desired indicators at levels that provided a balanced achievement of all the management objectives.

The development of the base model, objectives, and long-term management direction are described in sections 3.0, 4.0 and 6.0 of the Analysis Package.

3.7.1.1 Projected forest condition for the Crown productive forest (FMP-6)

Table FMP-6 shows how the projected forest condition for the Crown productive forest, depicted as the area (Ha) by forest unit and age class, changes over the next 100 years. The following graphs show the total Crown productive forest across all forest units and how they progress through time, from the year 2021 to 2121 (all productive forest at terms, 1,3,5,7,9,11). The fire-origin area in the A95 age class makes up a large portion of the productive land base in 2021. Given the disproportionate distribution of productive forest among age classes, the MATT team decided to develop an alternative modelling approach appropriate for the age class structure of the forest.

Figure 5, Age class distribution of Crown productive forest at plan start.

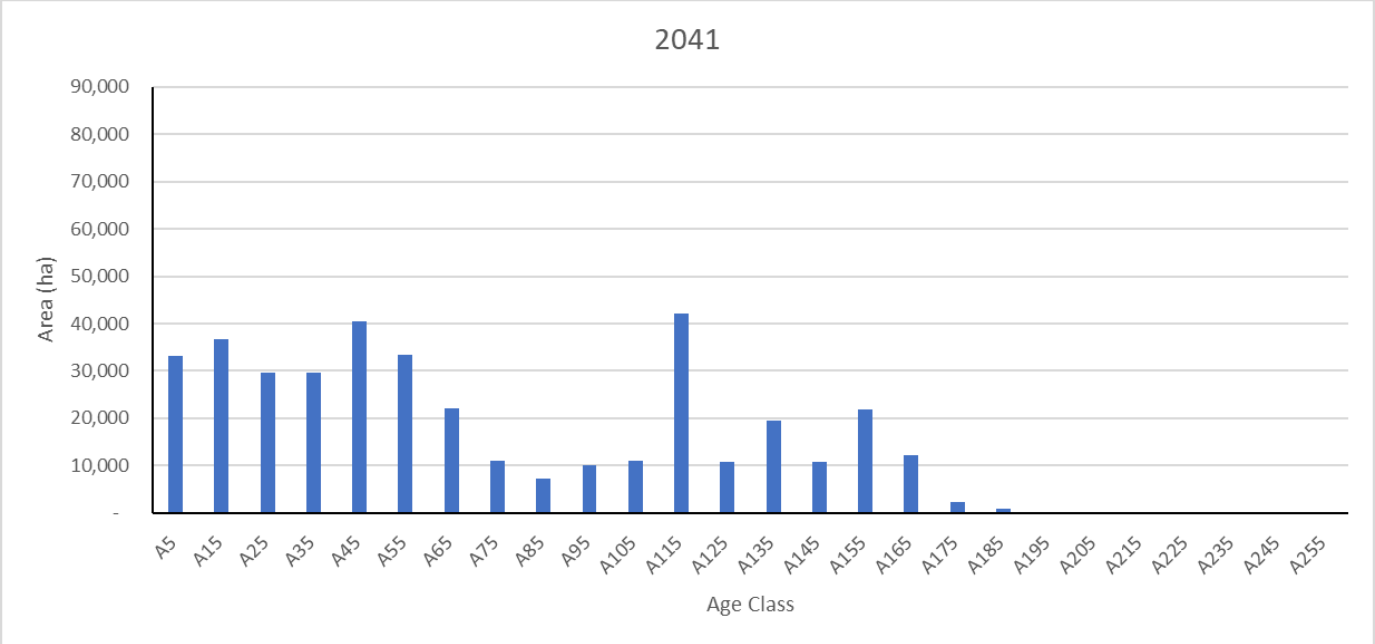


Figure 6, Age class distribution of Crown productive forest in 2041.

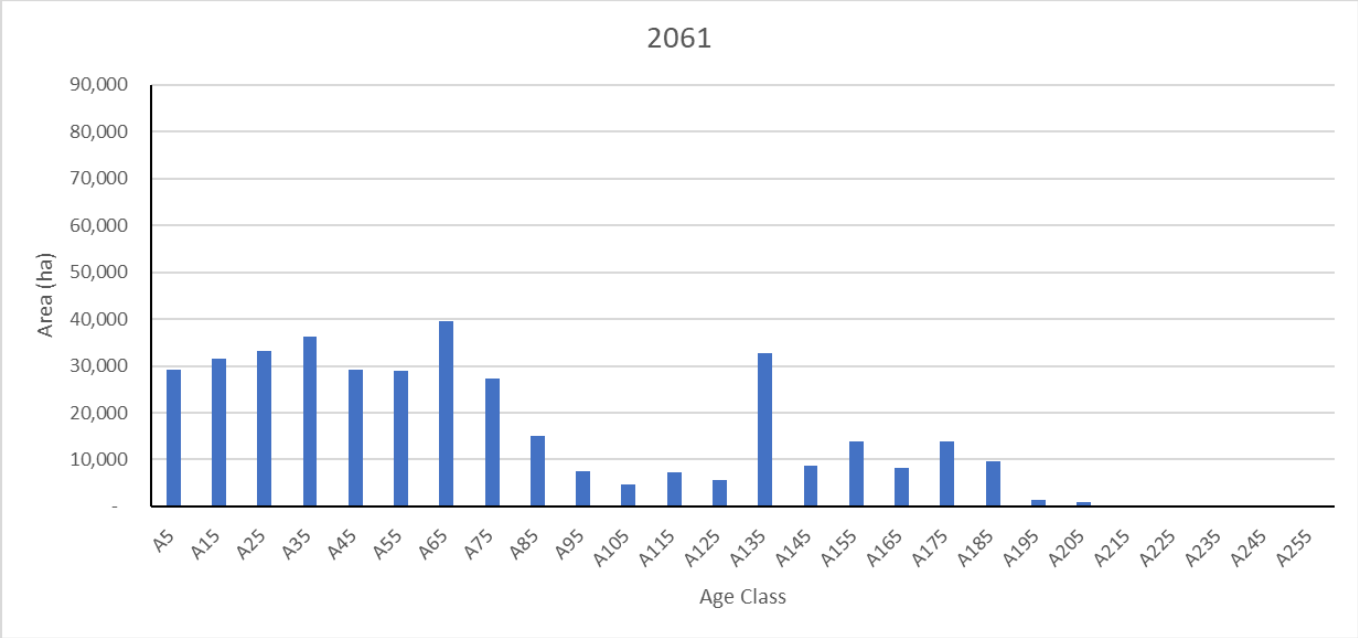


Figure 7,Age class distribution of Crown productive forest in 2061.

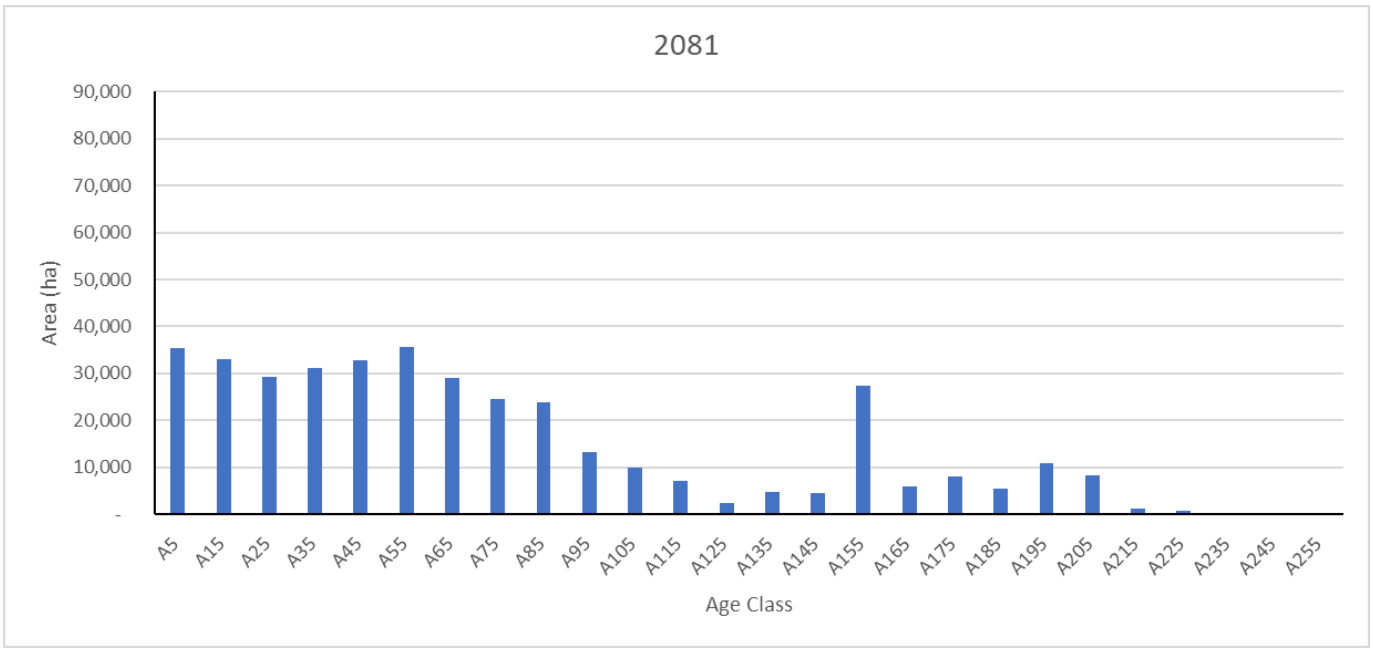


Figure 8, Age class distribution of Crown productive forest in 2081.

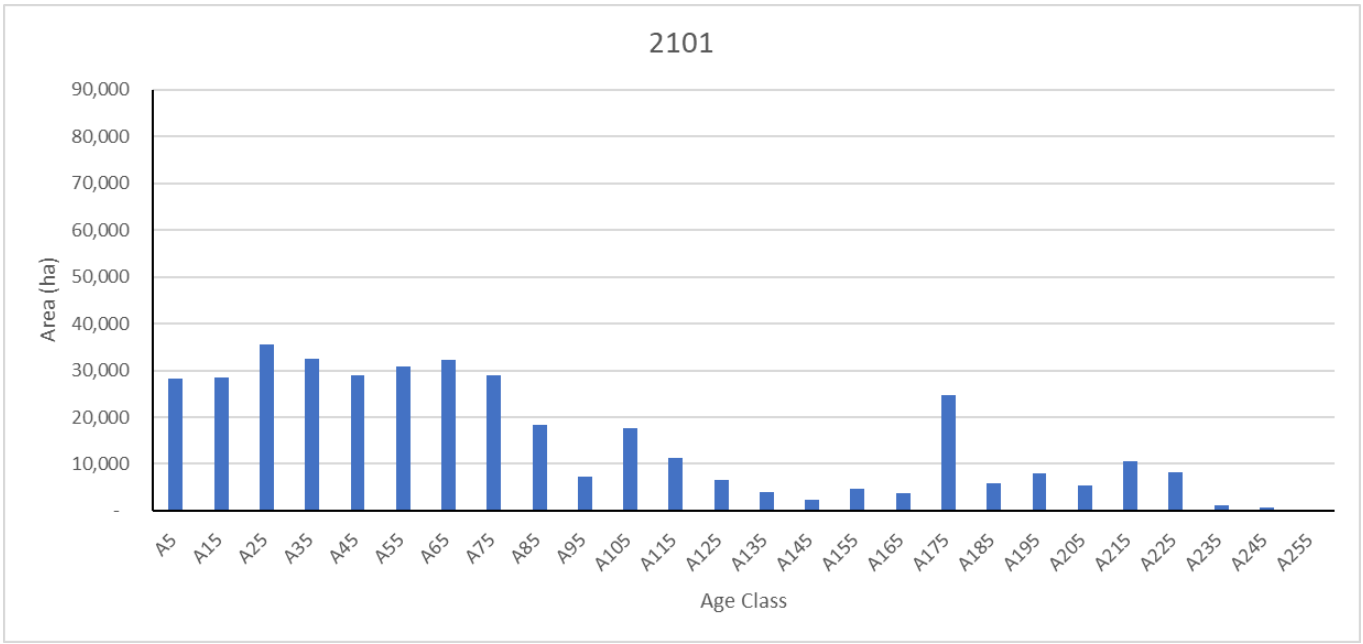


Figure 9, Age class distribution of Crown productive forest in 2101.

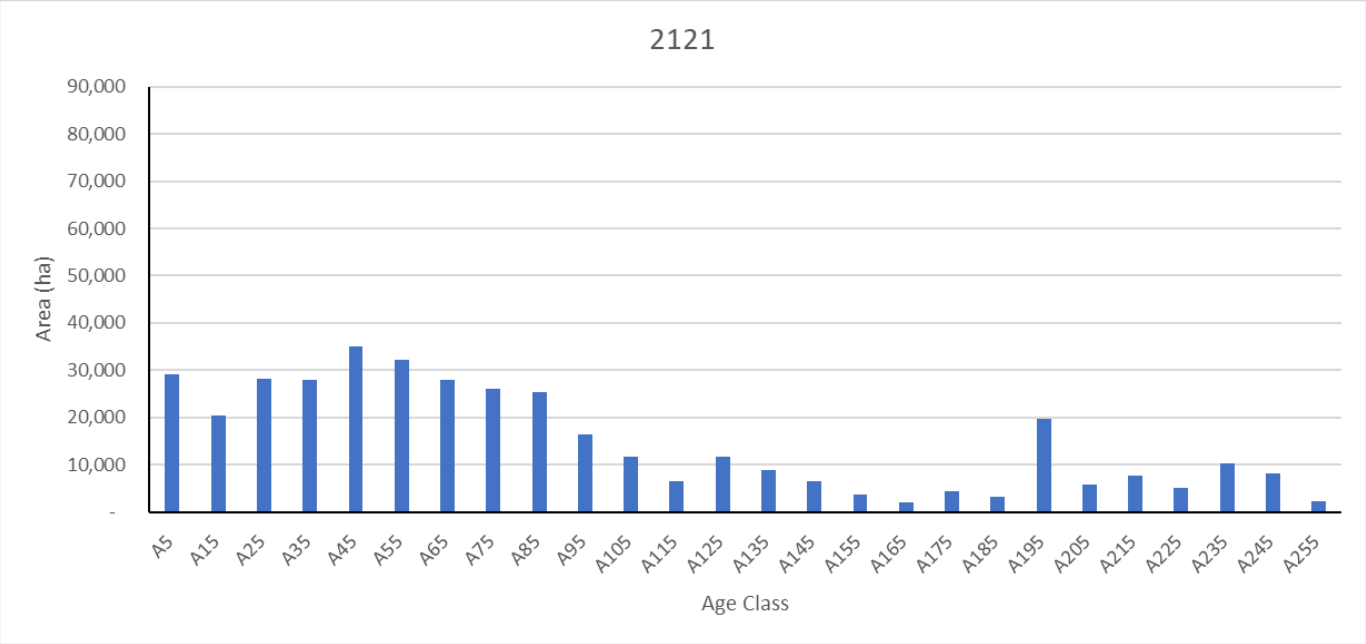
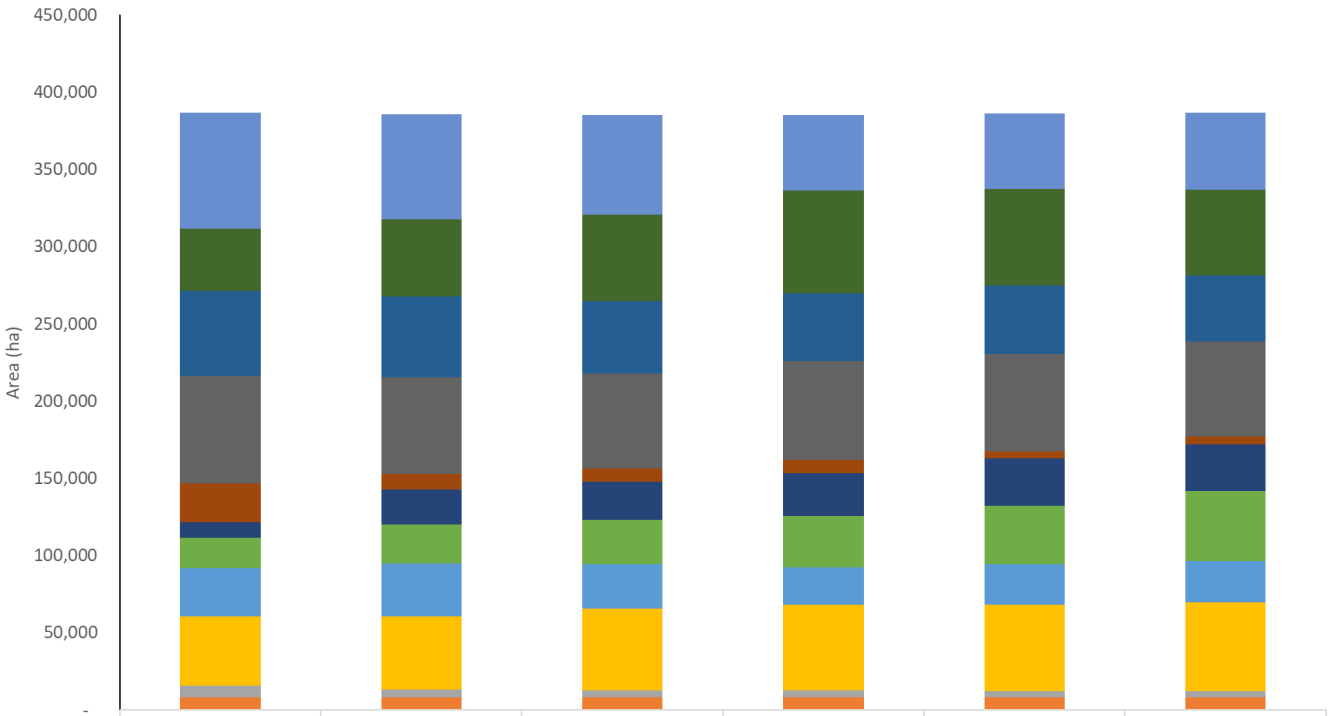


Figure 10, Age class distribution of Crown productive forest in 2101.

Typically, the SFMM model is optimized for "greatest value of timber over the entire planning horizon", however the age class structure of the forest was not congruent with this solving method. Specifically, most of the A95 cohort is harvested within the first 3 terms, after which harvest levels decrease until T8 when all the areas harvested in earlier terms comes back into rotation (section 5.1 of the Analysis Package 6.1(b) Supplementary Documentation). This dynamic resulted in a noticeable 'ebb and flow' of harvest area over the planning horizon (i.e. a highly uneven distribution of harvest area among terms), which is not conducive to providing a sustainable wood supply. For this reason, the SFMM model was optimized for "greatest value of timber during lowest planning period", with the intent of achieving more consistent harvest levels and wood supply over the 150-year planning horizon.



	2021	2041	2061	2081	2101	2121
SP1	75,376	68,153	64,804	48,808	48,935	49,925
SF1	40,444	49,847	56,082	66,504	62,490	55,275
SB1	54,817	52,395	46,827	43,917	44,254	42,821
PWR	46	46	46	46	46	46
PO1	69,415	62,506	61,437	64,078	62,742	61,497
PJ2	25,370	9,988	8,506	8,166	4,772	5,112
PJ1	9,817	22,683	24,476	27,804	30,806	30,255
MW2	19,873	24,991	28,768	33,373	37,544	45,363
MW1	31,017	34,393	28,690	24,019	26,442	26,592
LC1	44,770	47,218	52,869	55,901	55,783	57,352
BW1	7,566	5,096	4,560	4,139	3,844	4,007
BOG	8,326	8,326	8,326	8,326	8,326	8,326

Time period

Figure 11, Productive area by Forest Unit over time.

In general, forest unit area is relatively stable. It can be observed that PJ2 declines and PJ1 area increases, while the proportion of PJ1 + PJ2 (i.e. pine conifer group) area shows a small increase over the planning horizon. This result is expected as all post renewal transition rulesets for PJ2 target PJ1. The proportions of SF1 and SP1 in the upland conifer species group (U_CON) show fluctuations among terms, but the overall area remains relatively consistent over the planning horizon. The proportion of MW2 area increases over the planning horizon, resulting in a small net gain of Mixedwood area (i.e. MW1 and MW2 combined area). Area of Lowland conifer (L_CON) forest units and bog remain unchanged over the planning horizon. This is expected as there are no post renewal or natural succession transitions that add or remove area from this species grouping (i.e. no silvicultural action can create a new lowland site and visa-versa).

3.7.1.2 Projected Habitat for Selected Wildlife Species (FMP-7)

As mentioned earlier, Table FMP-7 and this section of the FMP predate the current direction regarding wildlife habitat management. Wildlife habitat is no longer tracked as outlined in FMP-7. The current direction is outlined in the Landscape Guide which indicates that wildlife habitat is assessed and tracked using the boreal Landscape Guide indicators, with the associated milestones that provide direction for achievement through time. These milestones and an assessment of their achievement is discussed in section 3.7.4.

3.7.2 Available Harvest Area by forest unit (FMP-8)

The area projected for harvest for the first ten-year term of the plan is called the available harvest area (AHA). Projections and assessment of AHA is an important component of the long-term management direction. The AHA has an associated available harvest volume (AHV) as described in the next section (3.7.4). A separate AHA is specified for each forest unit, and is presented in Table FMP-8 and shown graphically in Figure 13. In addition, Figure 12 portrays a comparison of the historical projected and actual harvested area (1997-2006), with the AHA projections for the 2006, 2011 and 2021 FMPs.

The 40-year harvest area is shown on the digital map file “MU390_2021_FMPDP_MAP_DistHarv_00”.

As shown in FMP-8, the total AHA per term fluctuates over the planning horizon, particularly after T6. The reason for this fluctuation is due to the age class structure of the land base at plan start (i.e. predominantly A95 age class), as it creates and ‘ebb and flow’ of harvest area over the planning horizon, despite the configuring the model to mitigate this affect.

There is a minor projected reduction in the total AHA between 2021 and 2121. After this point however, there is a decrease trend towards the end of the time horizon. In 2101 the AHA is projected to decrease to 18,315 ha, as shown in Table FMP-8 and Figure 12 below, this fluctuation varies greatly between forest units. The reduction in AHA, with the lowest point seen in since 2021, and associated volume is strongly influenced by the age-class structure of the forest. This has been discussed above and presented in detail in section X of the analysis package located in section X of the supplementary documentation.

As shown in Figure 12, the 2021 FMP long-term AHA projections are trending similarly but higher than the 2011 projection, until 2091. The 2021 FMP projection starts higher in the early terms but declines to 2091 then is the same as the 2011 projection at 2111, where it is positioned between the two previous FMP projections. The 2021 FMP AHA projection is influenced by the FMP process requirement to balance the achievement of all strategic objectives. It should be noted that the 2021 projections are a result of modeling built on the recent and improved eFRI, and the boreal landscape guide indicators, whereas the previous two FMPs were developed using the 1990 FRI and without boreal landscape guide indicators, which should be considered when comparisons are made. A predictable and sustainable AHA, driven by a sustainable harvest volume over time, was cited as a high priority at the LCC Desired Forest & Benefits meeting and is reflected in management objective #5. This objective is

being achieved as part of a balanced management approach which carefully considered all management objectives, including ecological objectives taken from the boreal landscape guide indicators. Implications of this projection are described in detail in the Social and Economic Assessment available in Section 3.7.5.

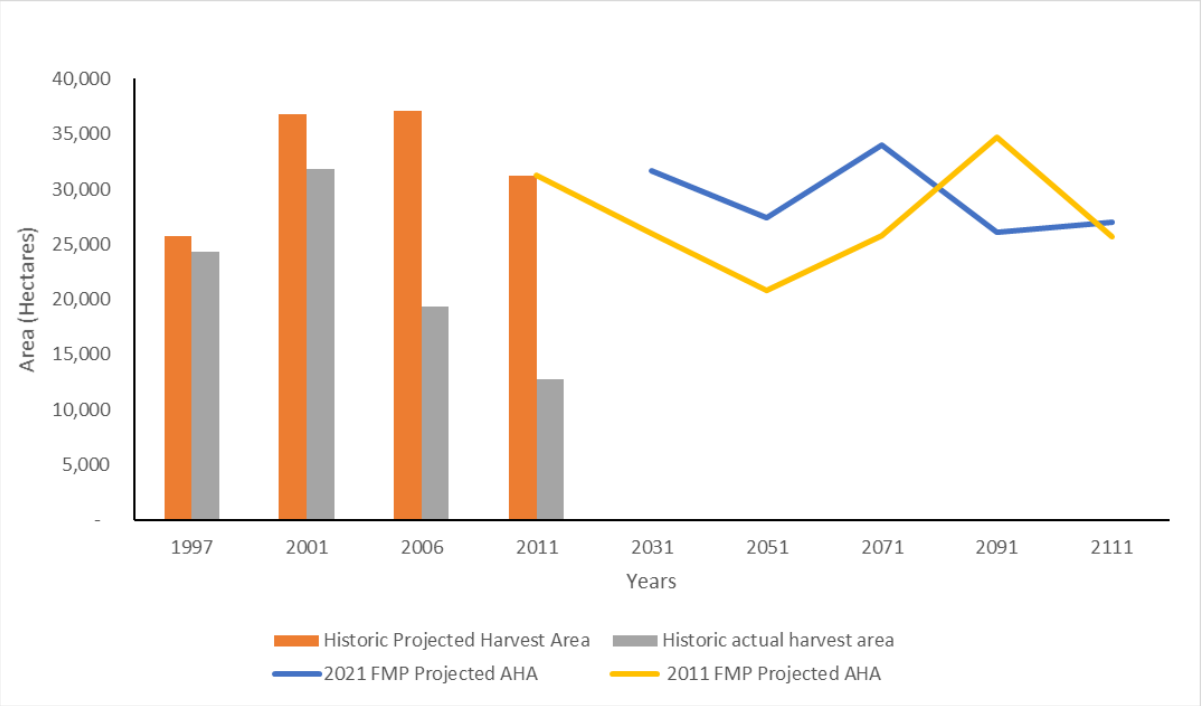
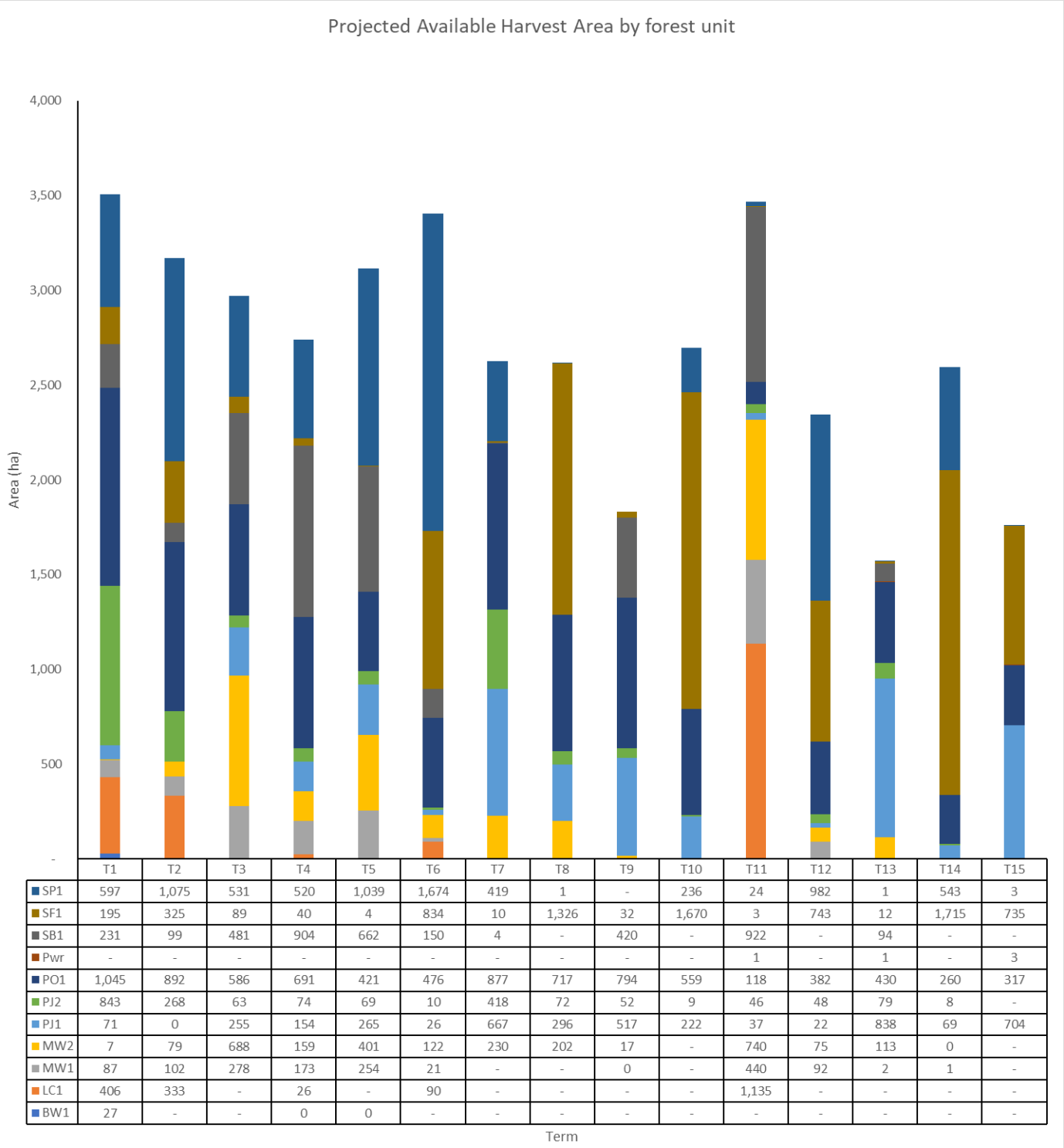


Figure 12, Projected avaialable and actual harvest area for the 1997, 2001, 2006 FMPs, and projected Available Harvest Area for the 2011 and 2021 FMPs



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
SP1	597	1,075	531	520	1,039	1,674	419	1	-	236	24	982	1	543	3
SF1	195	325	89	40	4	834	10	1,326	32	1,670	3	743	12	1,715	735
SB1	231	99	481	904	662	150	4	-	420	-	922	-	94	-	-
Pwr	-	-	-	-	-	-	-	-	-	-	1	-	1	-	3
PO1	1,045	892	586	691	421	476	877	717	794	559	118	382	430	260	317
PJ2	843	268	63	74	69	10	418	72	52	9	46	48	79	8	-
PJ1	71	0	255	154	265	26	667	296	517	222	37	22	838	69	704
MW2	7	79	688	159	401	122	230	202	17	-	740	75	113	0	-
MW1	87	102	278	173	254	21	-	-	0	-	440	92	2	1	-
LC1	406	333	-	26	-	90	-	-	-	-	1,135	-	-	-	-
BW1	27	-	-	0	0	-	-	-	-	-	-	-	-	-	-

Figure 13, Available Harvest Area for the 2021-31 LTMD (ha/year) over the planning horizon.

3.7.2.1 Available harvest volume by species group, and broad size or product group (FMP-9)

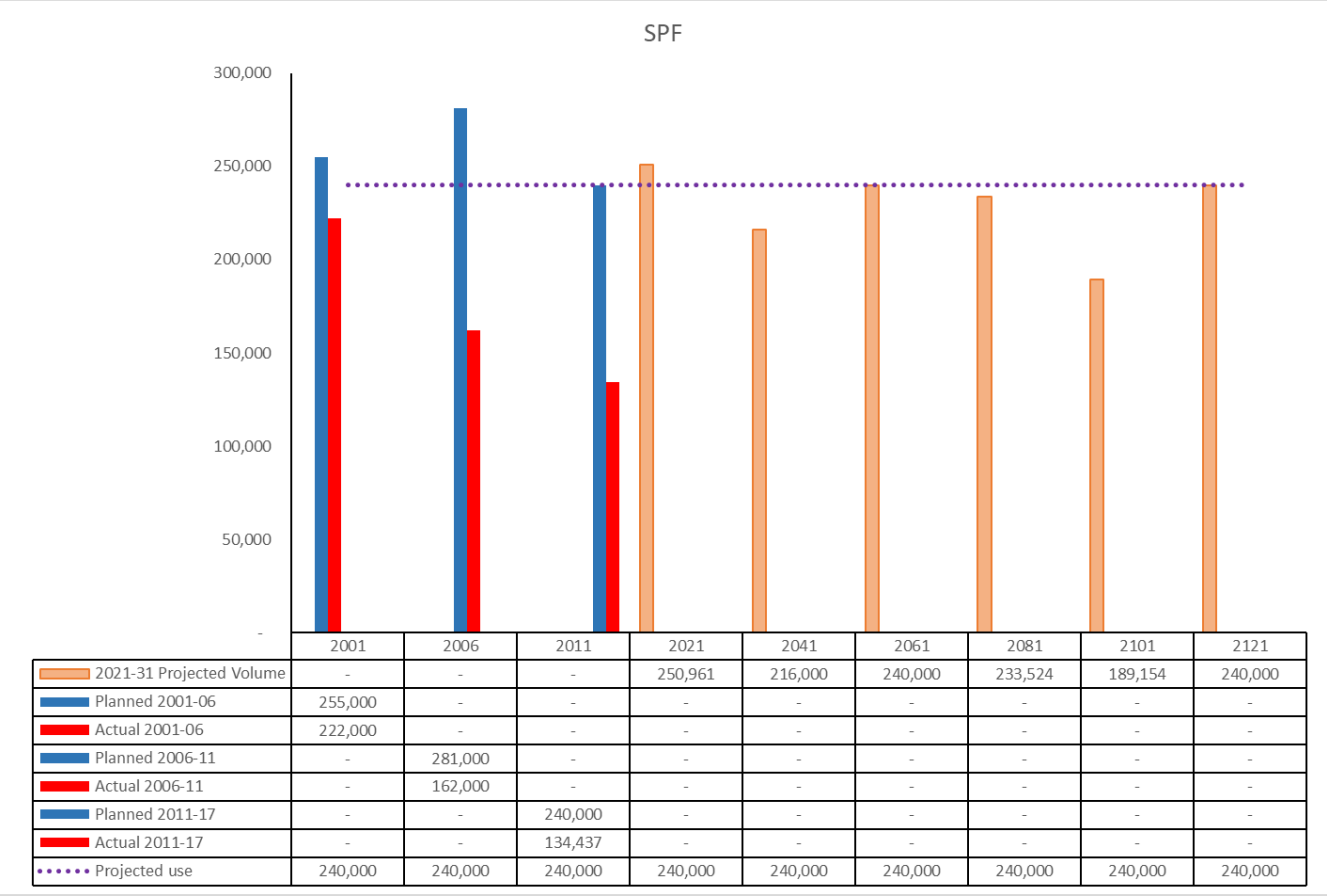
Table FMP-9 describes the projected available harvest volume by species group over the planning horizon.

The overall projected harvest volume for the LTMD follows a similar pattern to previous plans. The initial age-class structure of the forest largely influences the gradual drop followed by an increase in volume over time to 2121. The contents of FMP-9 are displayed in the Figure 14 through to Figure 16 below, along with the following items:

a) Projections from Previous FMPs (i.e. planned harvest volume)
b) Historic wood utilization (i.e. actual harvest volume)
c) The Current Industrial Demand

The projected wood supply use in the management unit available wood report (June 2019) was used as the current industrial demand for each species group. These projections consider demand levels based on current wood supply commitments and the expected consumption demand of receiving facilities from 2021-31.

The projected SPF volume indicator is achieved for the first planning period (2021-31), but not for the 2041-51, 2081-91, 2101-2111 planning periods (Refer to section 7 of the analysis package for full results and detailed results on the influencing factors affecting the SPF volume achievement). However, the 2021 projections show a general, but slight declining trend in the next 10 years and will then increase and level off until 2081 where it will observe another decline in 2101 to finish up back to CID levels in 2101.



	2001	2006	2011	2021	2041	2061	2081	2101	2121
2021-31 Projected Volume	-	-	-	250,961	216,000	240,000	233,524	189,154	240,000
Planned 2001-06	255,000	-	-	-	-	-	-	-	-
Actual 2001-06	222,000	-	-	-	-	-	-	-	-
Planned 2006-11	-	281,000	-	-	-	-	-	-	-
Actual 2006-11	-	162,000	-	-	-	-	-	-	-
Planned 2011-17	-	-	240,000	-	-	-	-	-	-
Actual 2011-17	-	-	134,437	-	-	-	-	-	-
Projected use	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000

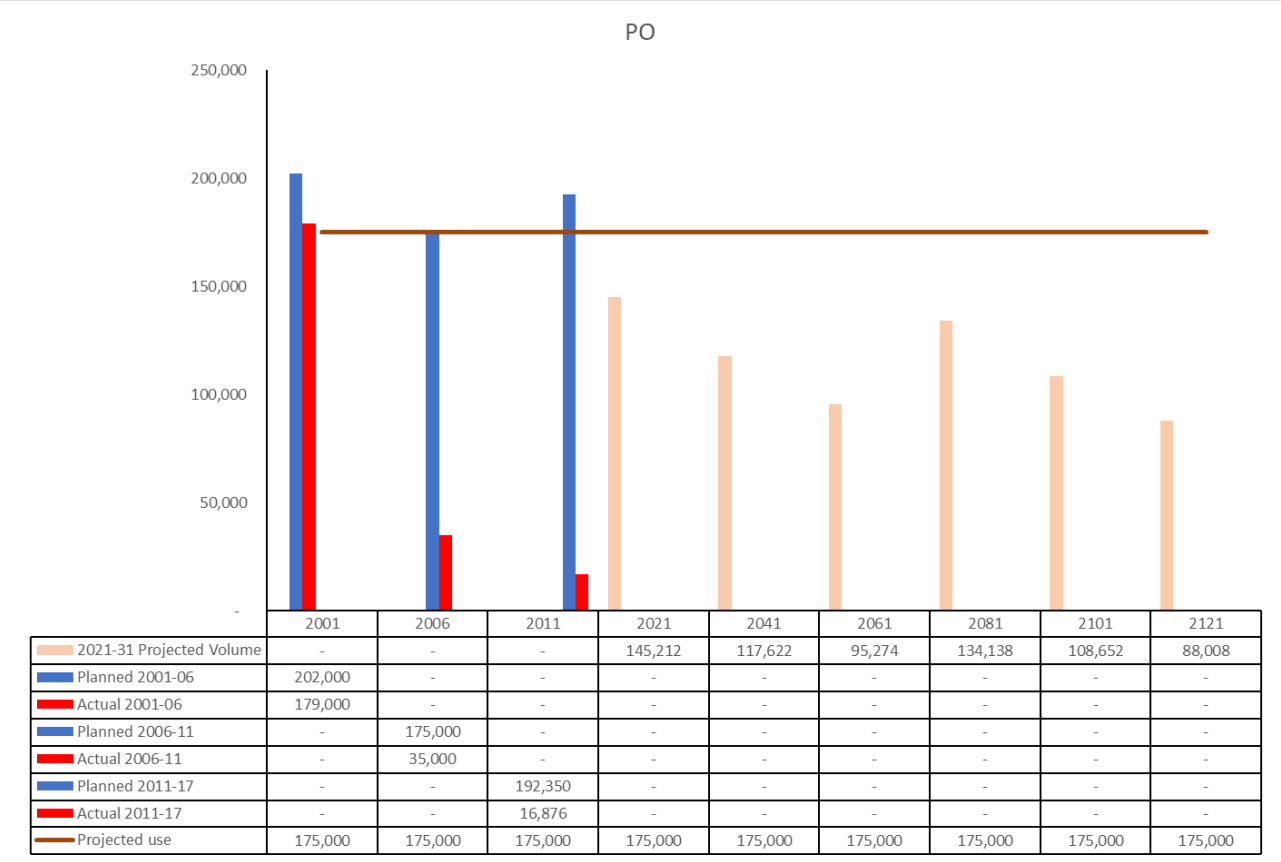
Figure 14, Spruce-Pine-fir volume over the past 3 planning terms and the LTMD planned volume projections for 2021-2121.

As shown in Figure 15 below, the utilization of Po volume has seen a steep decline from the 2006 and 2011 FMPs. This can also be attributed to the Great Recession of 2008 and the closing of the OSB processing facility in Wawa. The projected wood supply does not satisfy the projected use in any term over the planning horizon. This projected use is based on supply agreements for veneer products. The OSB grade poplar currently has no viable market.

The projected PO volume indicator is not achieved in any of the terms of the planning horizon (Refer to section 7 of the analysis package for full results and details on the influencing factors affecting the SPF volume achievement). The 2021 projections show a general declining trend until 2061 and will then increase in 2081 where it will observe another decline to 2101.

Overall, the strategy in the 2021 FMP aligns with past projections, with the differences identified above. The current forest condition, as captured in the new eFRI, is more accurate that previous inventories and is likely playing the largest role in the trend of projected available harvest volume between 2021 and 2121. Despite the decline trend over the next 5 terms shown in Figure 15 below, the overall projected total volume levels are more accurate and more likely reflect realizable volumes which will assist the processing facility with accurate projections. The projected harvest volumes were balanced with the landscape guide indicators to ensure the ecological sustainability of the forest was

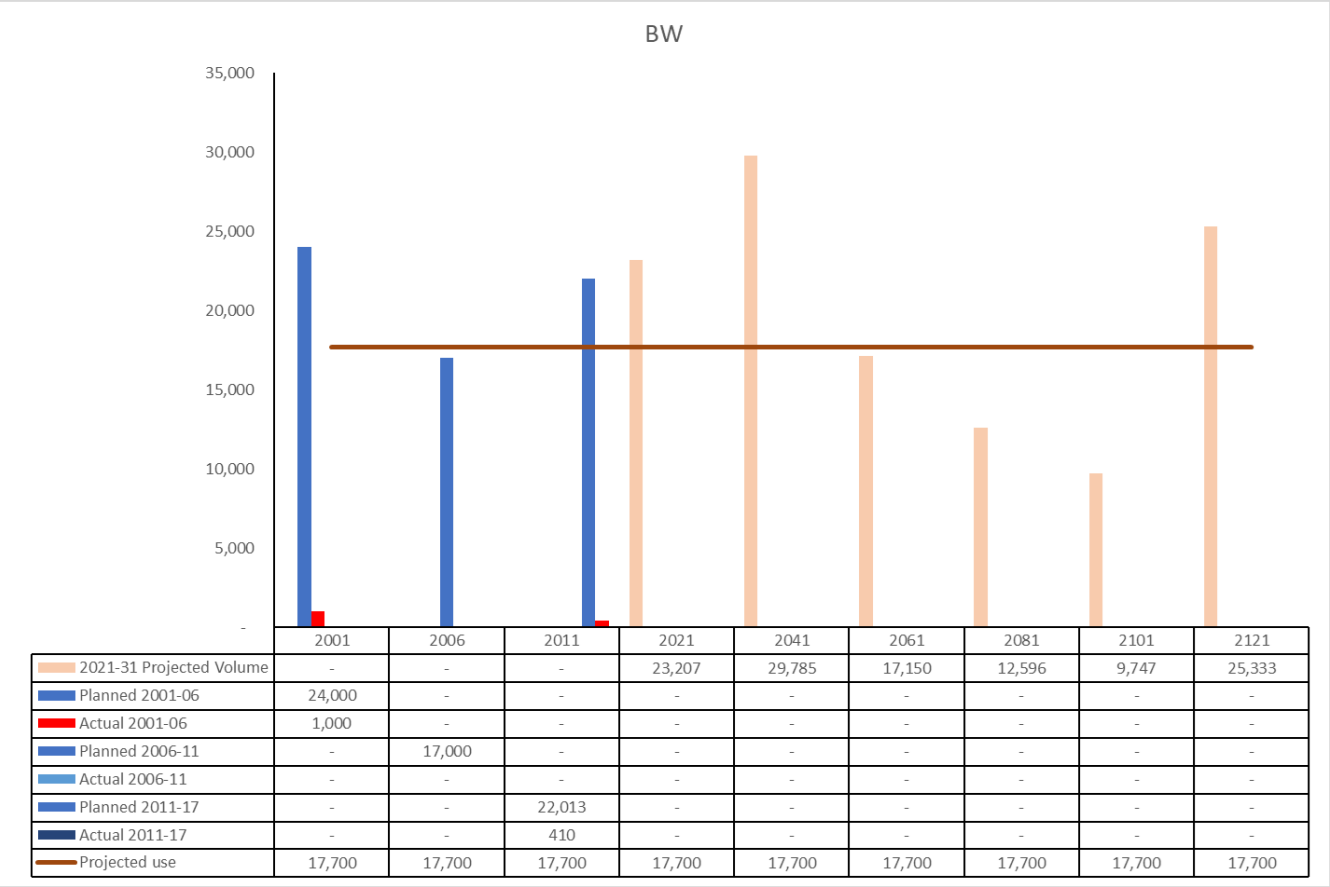
also maintained over the long term. The Socio-Economic Assessment found in section 3.7.6 describes the wood supply benefits for the communities depending on the Nagagami Forest.



	2001	2006	2011	2021	2041	2061	2081	2101	2121
2021-31 Projected Volume	-	-	-	145,212	117,622	95,274	134,138	108,652	88,008
Planned 2001-06	202,000	-	-	-	-	-	-	-	-
Actual 2001-06	179,000	-	-	-	-	-	-	-	-
Planned 2006-11	-	175,000	-	-	-	-	-	-	-
Actual 2006-11	-	35,000	-	-	-	-	-	-	-
Planned 2011-17	-	-	192,350	-	-	-	-	-	-
Actual 2011-17	-	-	16,876	-	-	-	-	-	-
Projected use	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000	175,000

Figure 15, Poplar volume over the past 3 planning terms and the LTMD planned volume projections for 2021-2121.

Birch fibre consumption is far less than planned in previous FMPs, presumably due to limited marketability. Consumption is not expected to improve as birch veneer is the only product with a viable market at the time of writing the 2021-31 FMP.



	2001	2006	2011	2021	2041	2061	2081	2101	2121
2021-31 Projected Volume	-	-	-	23,207	29,785	17,150	12,596	9,747	25,333
Planned 2001-06	24,000	-	-	-	-	-	-	-	-
Actual 2001-06	1,000	-	-	-	-	-	-	-	-
Planned 2006-11	-	17,000	-	-	-	-	-	-	-
Actual 2006-11	-	-	-	-	-	-	-	-	-
Planned 2011-17	-	-	22,013	-	-	-	-	-	-
Actual 2011-17	-	-	410	-	-	-	-	-	-
Projected use	17,700	17,700	17,700	17,700	17,700	17,700	17,700	17,700	17,700

Figure 16, Birch volume over the past 3 planning terms and the LTMD planned volume projections for 2021-2121.

3.7.3 Selection of Areas for Harvest

During the development of the FMP, the proposed harvest areas and selection criteria are presented to the public for review and input. The preferred harvest areas portrayed for the LTMD include areas eligible for allocation during the 10-year period of the plan (2021-2031).

To begin implementation of the long-term management direction, areas are selected for harvest for the 10-year plan (2021-2031) using defined selection criteria. This section contains a description of the criteria used for the selection of harvest areas. Also discussed are the effects of the harvest area selection criteria on the long-term management direction. Finally, this section contains a description of the criteria used for the selection of areas for renewal and tending activities.

The following criteria were considered in the identification of preferred areas:

- The forest stand will be managed, and available for forestry.
- The forest stand will be eligible for harvest based on it reaching the age of operability within the 10-year FMP. If not yet at the age of eligibility, it must contribute to improving the

operability of a harvest block or have strategic implication such as completing operations in a DCHS Block.

- The forest stand will meet the criteria of the first 10-year of allowable harvest area from the proposed management strategy by forest unit and age class.
- The forest stand is near or immediately adjacent to existing road infrastructure, or road corridors planned for construction.
- The forest stand is part of a larger cluster of stands that are also preferred.
- The forest stand does not contain management concerns such as steep terrain, or rock, wet etc.
- The forest stands exhibits characteristics of high-volume potential (i.e. stocking, height, site class, silviculture intensity).
- The forest stand shows potential to be used a demonstration project for public information about forest management practices (i.e. management of white pine or cut to shore operations).
- The forest stand contributes to meeting the balanced allowable harvest area that cause movement towards the structure and composition, and patterns of the proposed management strategy.
- The forest stand is not of a size or delineation that would create operational challenges requiring additional water crossings, or roads to be installed.
- The forest stand is not located immediately adjacent to a feature (water or other) area which will be buffered by a no cut reserve.
- The Planned Harvest Area did not exceed the Available Harvest Area by forest unit.

Areas were allocated based on the available harvest area by forest unit age-class combinations, as concluded in the development of the long-term management direction. All the above criteria influenced the selected allocations. Some criteria factored more prominently than others depending on the circumstance. The total ten-year allocated area does not exceed the sustainable available harvest area by forest unit.

There are several factors that can limit the selection of specific areas for harvest. The geographic location of the age-class area by forest unit, the distribution and configuration of non-harvest reserves (AOC's) and the forested/non-forested lands that are not available for harvest are spatial constraints that limit the flexibility to allocate the AHA from the model. For example, non-forested land and private land are not available for harvest, yet their spatial distribution affects the assemblage of harvest area.

Challenges are also faced with the spatial arrangement of private land, water bodies, provincial parks and conservation reserves adjacent to, or within, the management unit boundary, increasing the complexity in meeting the modeled harvest plan from the LTMD.

As a first step, blocks were carefully developed and reviewed by HPL and Columbia Forest Products and further refinements were made to ensure the blocks would be operable based on size, configuration, terrain, road access requirements and stand condition (based on eFRI imagery). This resulted in some level of age-class substitution within each forest units, however significant efforts were made to remain above or very close to the lower age-class limits for each forest unit.

As the FMP process requires that public input have an influence on the allocation process. Consultation with First Nation and Métis communities, local cottage associations, resource-based tourism operators, private landowners and other resource stakeholders have all lead to adjustments to the proposed harvest allocations. Harvest areas are portrayed in a series of Areas Selected for Operations Maps, which are available in digital format with this FMP (example file name: MU390_2021_FMP_MAP_Ops54530_00.pdf).

3.7.4 Assessment of Objective Achievement

Some FMP objectives are assessed at LTMD stage two, while others are assessed at later stages of plan development or implementation. Results from the assessment of objective achievement required at the draft plan stage of FMP development are summarized in Table FMP-10. Objectives assessed at the LTMD and draft plan stages are described in the following sections. Refer to section 6.5 and 7 of the Analysis Package for further details about LTMD management objective achievement.

3.7.4.1 Management Objective 1

To create a forest landscape condition which provides an adequate amount and distribution of caribou habitat within the continuous and discontinuous caribou zones consistent with the Boreal Landscape Guide.

Indicator 1.1: Winter suitable Habitat

The desired level (18,908 Ha - 22,238 ha) is achieved in some planning terms, but it is not achieved in the short (2031), medium (2041), or long terms (2121). The target to maintain plan start levels is not achieved in the short, medium, or long terms. This lack of achievement is caused by the harvest levels associated with the spatial requirements of the DCHS as they do not maintain enough winter suitable forest cover within the continuous zone in some terms. Adhering to the spatial requirements of the DCHS was considered a higher priority, therefore lack of achievement was not considered detrimental to the LTMD.

Indicator 1.2: Area of Mature Conifer

The desired Level (6,955 Ha - 11,836 Ha) for Caribou Mature Conifer is not met in any term. The target level to increase is met in the short (2031), but not the medium (2031), or long terms (2121). This lack of achievement is caused by the harvest levels associated with the spatial requirements of the DCHS as they do not maintain enough Mature conifer forest cover within the continuous zone in some terms. Adhering to the spatial requirements of the DCHS was considered a higher priority, therefore lack of achievement was not considered detrimental to the LTMD.

Indicator 1.3: Texture of caribou Mature Conifer habitat (>28%)

The target to increase towards the desired level (i.e. SRNV mean = 0.48) is not achieved. These results are expected, as only a small portion of the continuous zone is eligible due to the DCHS, providing little opportunity to cause movement in achievement levels. The harvest pattern is consistent with the DCHS created in the 2011 plan, so it is expected that the texture indicator performance will improve as the

DCHS is implemented in future planning terms. Adhering to the DCHS is considered a higher priority, so lack of achievement is not considered detrimental to the LTMD.

Indicator 1.4 Texture of Caribou Winter Suitable Habitat (>75%)

Movement is made towards the desired level (i.e. SRNV mean = 0.50) however it is not achieved. These results are expected, as only a small portion of the continuous zone is eligible due to the DCHS, providing little opportunity to cause movement in achievement levels. Adhering to the DCHS is considered a higher priority, so lack of achievement is not considered detrimental to the LTMD.

3.7.4.2 Management Objective 2

To direct forest management activities to maintain or enhance natural landscape structure, composition, texture, and patch size that provide for the long-term health of forest ecosystems and associated wildlife species by applying the Boreal Landscape Guide.

Indicator 2.1: Immature and Older Pine (IOP)

Table FMP-10 provides a comparison of the immature and older pine area for the LTMD and the target level (SRNV IQR: 10,953 ha - 22,378 ha). The desired level is to increase and maintain within the interquartile range based on the BLG directional statements. The target area was achieved in the long-term, with areas increasing from 5,541 hectares at plan start (2021) to 6,958 hectares in the short term (2031) to an area of 19,528 hectares after 100 years (2121). The interquartile range is achieved at term 5

Indicator 2.2: Immature and Older Hardwood and Immature Mixedwood (IOHIM)

Table FMP-10 provides a comparison of the immature and hardwood and Immature Mixedwood area for the LTMD and the target level (SRNV IQR: 54,013 ha - 76,670 ha). The desired level is to maintain within the interquartile range based on the BLG directional statements. Plan start levels were within the IQR and were maintained over the short, medium, and long term.

Indicator 2.3: Mature and Older Mixedwood (MOM)

Table FMP-10 provides a comparison of the Mature and Older Mixedwood area for the LTMD and the target level (SRNV IQR: 35,212 ha - 52,522 ha). The desired level is to increase and maintain within the interquartile range based on the BLG directional statements. The target area was achieved in the long-term, with areas increasing from 20,591 hectares at plan start (2021) to 21,042 hectares in the short term to an area of 39,251 hectares after 100 years (2121).

Indicator 2.4: Mature and Older Conifer (MOC)

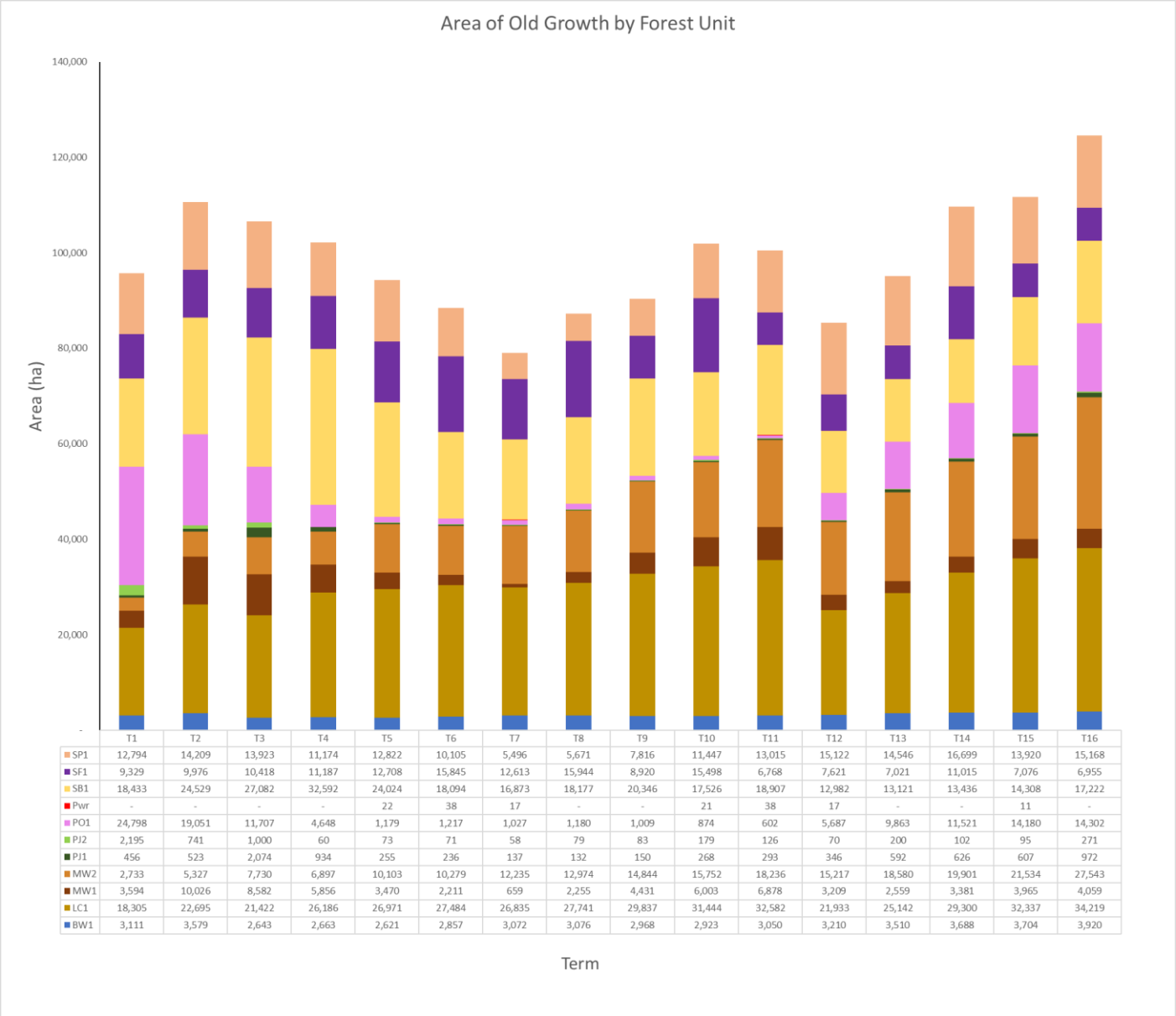
Table FMP-10 provides a comparison of the Mature and Older Conifer area for the LTMD and the target level (SRNV IQR: 29,983 ha - 44,076 ha). The desired level is to decrease and maintain within the interquartile range based on the BLG directional statements. The target area was achieved in the medium term, with areas decreasing from 61,232 hectares at plan start (2021) to 35,940 hectares in the medium term (2041) to an area of 37,657 hectares after 100 years (2121).

Indicator 2.5: Mature and Older Lowland Conifer

Table FMP-10 provides a comparison of the Mature and Older Lowland Conifer area for the LTMD and the target level (SRNV IQR: 65,805 ha - 109,848 ha). The desired level is to maintain within the interquartile range based on the BLG directional statements. The target area was achieved in the short (2031), Medium (2041), and Long term (2121), however achievement drops below the IQR between 2041 and 2121. It is difficult to change achievement of this landscape class, as it is generally not feasible to create or eliminate lowland area.

Indicator 2.6: Old growth Area

Table FMP-10 provides a comparison of the Late/successional area for the LTMD and the target level (SRNV IQR: 65,805 ha - 109,848 ha). The desired level is to maintain within the interquartile range based on the BLG directional statements. Plan start levels are within the IQR (96,364 ha), however this area increases above the upper IQR for the short (2031; 113,080 ha) and medium (2041; 110,625) terms but is achieved in the Long term (2121). The IQR is initially met at T5 and remains within the IQR for the duration of the planning horizon, except for Term 12 (2141), where achievement drops slightly below the IQR.



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
SP1	12,794	14,209	13,923	11,174	12,822	10,105	5,496	5,671	7,816	11,447	13,015	15,122	14,546	16,699	13,920	15,168
SF1	9,329	9,976	10,418	11,187	12,708	15,845	12,613	15,944	8,920	15,498	6,768	7,621	7,021	11,015	7,076	6,955
SB1	18,433	24,529	27,082	32,592	24,024	18,094	16,873	18,177	20,346	17,526	18,907	12,982	13,121	13,436	14,308	17,222
Pwr	-	-	-	-	22	38	17	-	-	21	38	17	-	-	11	-
PO1	24,798	19,051	11,707	4,648	1,179	1,217	1,027	1,180	1,009	874	602	5,687	9,863	11,521	14,180	14,302
PJ2	2,195	741	1,000	60	73	71	58	79	83	179	126	70	200	102	95	271
PJ1	456	523	2,074	934	255	236	137	132	150	268	293	346	592	626	607	972
MW2	2,733	5,327	7,730	6,897	10,103	10,279	12,235	12,974	14,844	15,752	18,236	15,217	18,580	19,901	21,534	27,543
MW1	3,594	10,026	8,582	5,856	3,470	2,211	659	2,255	4,431	6,003	6,878	3,209	2,559	3,381	3,965	4,059
LC1	18,305	22,695	21,422	26,186	26,971	27,484	26,835	27,741	29,837	31,444	32,582	21,933	25,142	29,300	32,337	34,219
BW1	3,111	3,579	2,643	2,663	2,621	2,857	3,072	3,076	2,968	2,923	3,050	3,210	3,510	3,688	3,704	3,920

Figure 17, Old Growth Area (ha) across all Plan Forest units

The balance of old growth among forest units shows some variation between terms. This is especially apparent in the PO1 forest unit which declines rapidly from T2 to T4. A sizable portion of the landbase is A95 PO1 at plan start, so it is expected to see a corresponding drop in PO1 area as this large age class is harvested/succeeds during the first 4 terms of the planning horizon. Pine forest units (PJ1 and PJ2) show very little old growth over the planning horizon. This dynamic is likely associated with competing objectives for SPF volume, as the current industrial demand is narrowly met (if at all) in some terms. All forest units maintain old growth area over the entire planning horizon, except for PJ1 and PJ2.

PWR old growth is not tracked as there are only 46 ha on the landbase.

Area of Red and White pine

Given that there is only 46 ha of Red and White Pine area on the landbase at plan start, the Planning Team decided it was acceptable to not project achievement of this indicator over the planning horizon. The target and desired levels for this indicator are to increase area. Silviculture ground rules were developed to increase red pine area, should the appropriate circumstances occur during plan implementation.

Area of Pine Conifer

Table FMP-10 provides a comparison of the Pine Conifer area for the LTMD and the target level (SRNV IQR: 30,013 ha - 54,287 ha). The desired level is to maintain within the interquartile range based on the BLG directional statements. The target area was achieved in the short (2031), Medium (2041), and Long term (2121). Achievement levels remain within the Interquartile range for the duration of the planning horizon.

Area of upland conifer

Table FMP-10 provides a comparison of the Upland Conifer species group for the LTMD and the target level (SRNV IQR: 49,265 ha - 64,937 ha). The desired level is to decrease and maintain within the interquartile range based on the BLG directional statements. The target area was not achieved in any term, although movement is made towards the desired level after Term 6. This lack of achievement can be attributed to the amount of young Spruce-Pine (SP1) area on the landbase. Once these areas reach operable age, movement can be made towards the target level.

Area of Lowland Conifer

Table FMP-10 provides a comparison of the Lowland Conifer species group for the LTMD and the target level (SRNV IQR: 123,333 ha - 136,806 ha). The desired level is to decrease and maintain within the interquartile range based on the BLG directional statements. The target area was not achieved in any terms. Generally, areas of the landbase that contribute to lowland conifer produce forest types that are only capable of establishing in lowland ecosites. For this reason, it is difficult to convert area to and from the lowland conifer species group.

Area of young forest

Table FMP-10 provides a comparison of young forest species group for the LTMD and the target level (SRNV IQR: 39,365 ha - 80,141 ha). The desired level is to decrease and maintain within the interquartile range based on the BLG directional statements. The target area was not achieved in any terms, although movement is made towards the desired level after term 6. The amount of young forest at plan start prevents movement towards the desired level.

Landscape Pattern

Management Objective 2: To direct forest management activities to maintain or enhance natural landscape structure, composition, texture, and patch size that provide for the long-term health of forest ecosystems and associated wildlife species by applying the Boreal Landscape Guide

This management objective intended to move the forest towards a distribution of disturbances that resemble a natural landscape pattern. The indicators used to measure the spatial objective assessment are:

- Mature and old forest at 500- and 5,000-hectares scales (i.e. OLT hexagon mosaic)
- Young forest patch size (<36 years).

The following section details projections of these spatial indicators for harvest areas identified in the proposed management strategy (i.e. LTMD) relative to plan start levels and target levels (i.e. SRNV mean).

Mature and Older forest 500 ha scale (Indicators 2.12-2.16)

The target for this indicator is to move towards and/or maintain the desired level (i.e. the SRNV mean). Figure 18, shows the frequency distribution of forested area within each of the five proportion classes (i.e., proportion of 500 hectare hexagons with 0-20%, 21-40%, 41-60%, 61-80% and >80% of mature and old forest) for preferred harvest areas identified at LTMD.

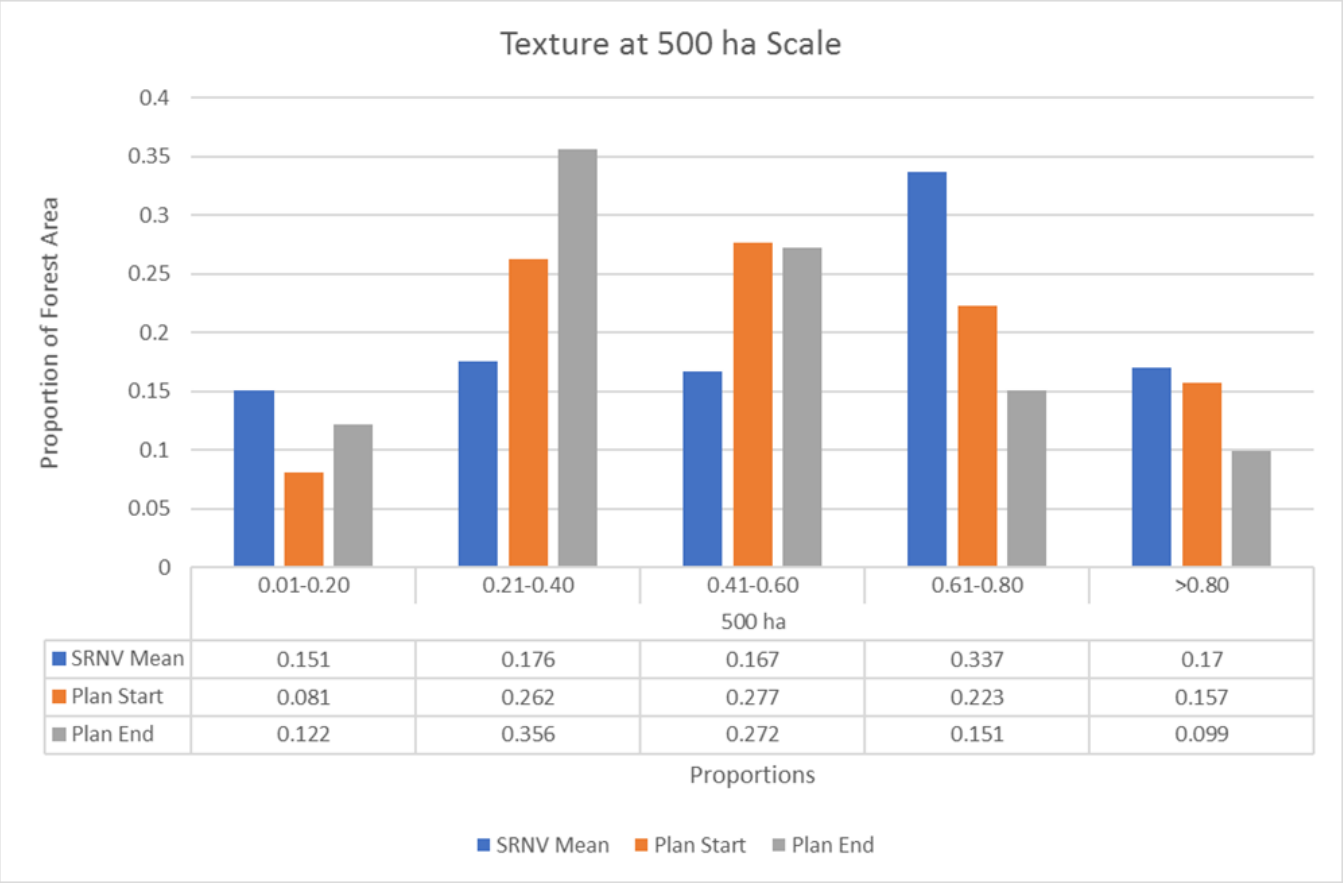


Figure 18, Texture of mature and old forest (500 ha scale) at plan start (2021), and plan end (2031) compared to the SRNV mean.

The preferred harvest areas cause movement towards SRNV mean in the 0.01-0.20 and 0.41-0.6 proportion categories, and movement away in the 0.21-0.4, 0.61-0.8, and >0.8 categories.

Preferred areas identified at stage 2 of the LTMD were aggregated to reduce the amount of allocations immediately adjacent to remote tourism outfitters. This likely contributes to the decrease in the 0.61-0.8 and >0.8 texture categories by plan end.

Preferred harvest areas identified in the LTMD Stage 2 were aggregated in locations that are not in the vicinity of remote tourism operations, which contributes to the decrease in the hexagons with higher proportions of mature and old forest (61-80%, and >80%). Additionally, past management strategies emphasized harvest areas of <260 ha and creation of edge habitat for moose, which also contributes to this decrease.

This decrease in high density mature and old coverage has potential implications for wildlife that depend on the mature and old seral stages (e.g. pine marten).

To bring the current texture profile closer to the SRNV mean, the proportion of area with hexagons that contain 61-80%, and >80% mature forest would need to increase. The current spatial arrangement of preferred harvest areas provide the opportunity to produce large contiguous even-aged stands, which will lead to higher density of mature and old forest once these areas reach the age of onset.

Additionally, harvest patterns of future FMPs that seek to 'de-fragment' areas with lower density of mature and older conifer will also contribute to increasing the proportion of high density hexagons in the future. Changes to these texture proportions will need to occur over several planning terms, as high-density areas of mature and older area cannot be created through harvesting activities (in the short term).

Mature and Older forest 5000 ha scale (Indicators 2.17 to 2.21)

The target for this indicator is to move towards and/or maintain the desired level (i.e. the SRNV mean). Figure 20, shows the frequency distribution of forested area within each of the five proportion classes (i.e., proportion of 5,000 hectare hexagons with 0-20%, 21-40%, 41-60%, 61-80% and >80% of mature and old forest) for preferred harvest areas identified at the LTMD.

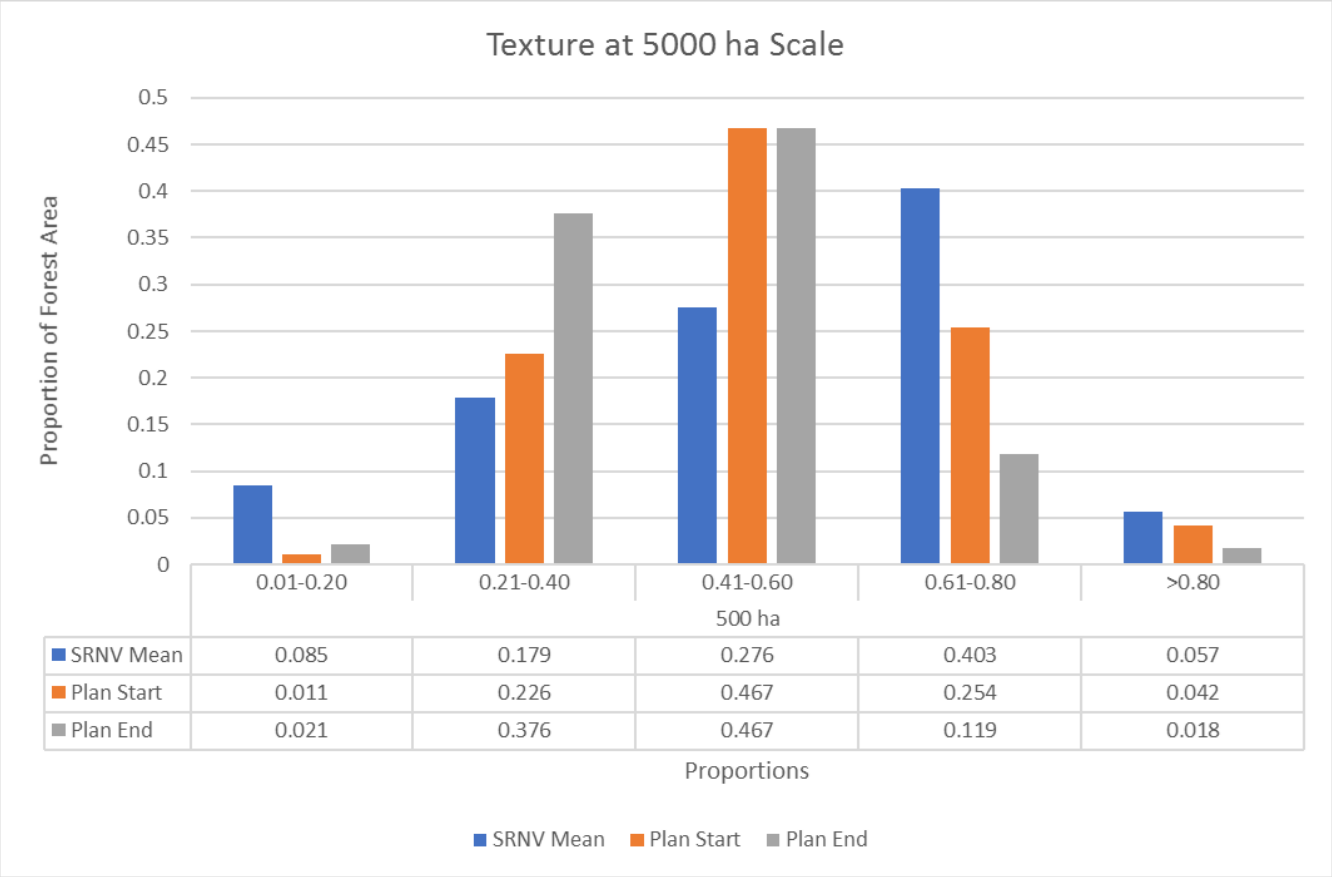


Figure 19, Texture of mature and old forest (5000 ha scale) at plan start (2021), and plan end (2031) compared to the SRNV mean.

The 5000 ha texture indicator shows movement away from the SRNV in the 0.21-0.4, 0.61-0.8 and >0.8 categories at plan end. The 0.01-0.2 category shows slight movement towards, and the 0.41-0.6 categories is maintained.

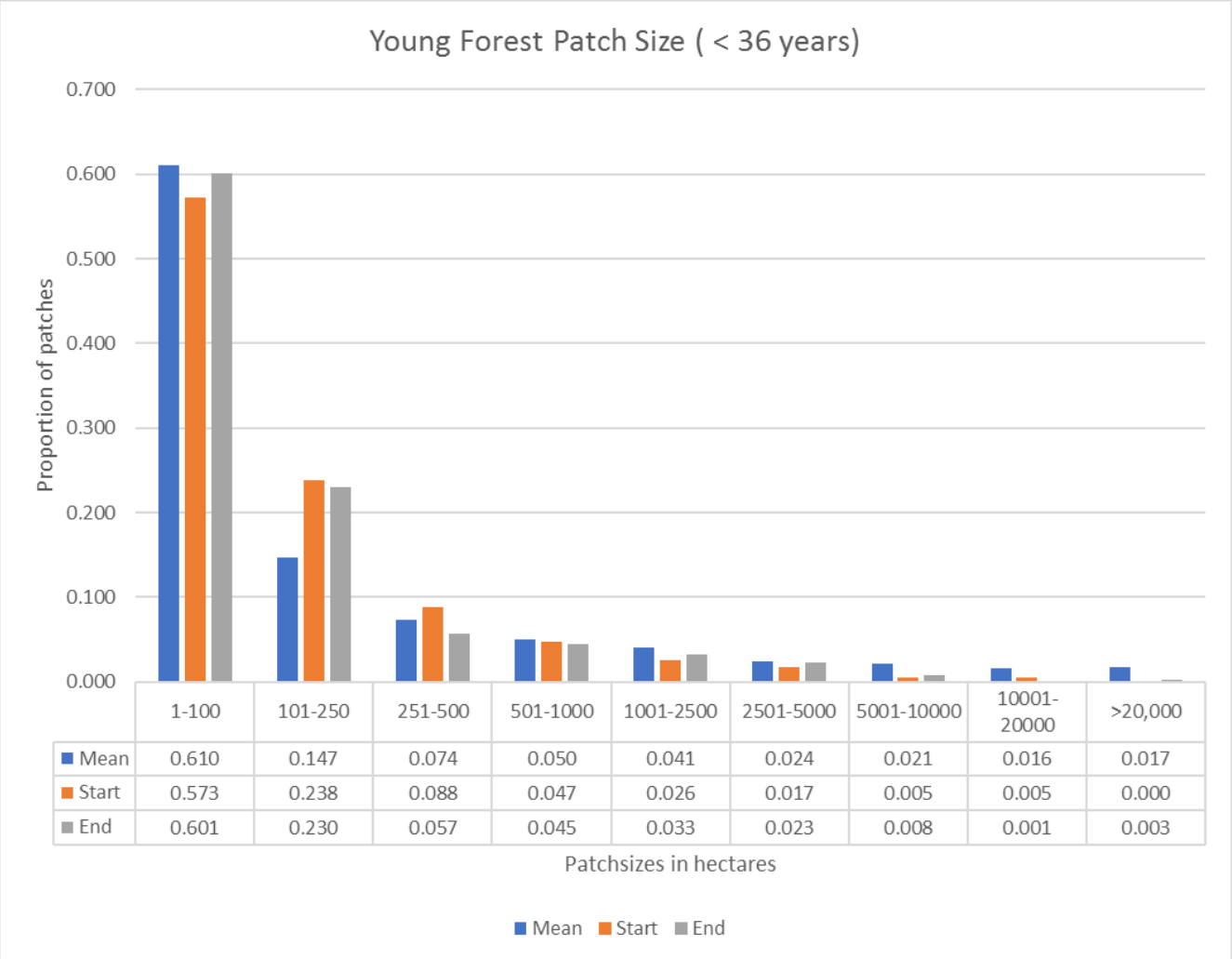
Like the 500 ha results, Aggregation of preferred harvest areas to avoid remote tourism and past management strategies that emphasize <260 ha disturbances and moose habitat are the main contributors to the decrease in 0.61-0.8 and >0.8 hexagons.

This decrease in high proportion mature and old hexagons, may have implications for wildlife species that depend on the habitat provided by mature and old seral stages (e.g. pine marten).

The aggregation of harvest areas for the current plan will create potential for future large contiguous patches of even aged forest which may serve to increase future achievement of the 0.6-0.8 and >0.8 proportion categories. Additionally, future harvest patterns may also help create large disturbance patterns by emphasizing harvest in hexagons with lower proportions of mature and older forest (i.e. 0.21-0.4 and 0.41-0.8) similar to the 500 ha results, improvement in this indicator will take a number of terms to complete as high concentrations of mature an old forest cannot be created through harvesting activities (in the short term).

Young Forest Patch Size (Indicators: 2.22-2.30)

The target for this indicator is to move towards and/or maintain the desired level (i.e. the SRNV mean). Figure 20, shows the frequency distribution of young forest area (<36 years old), in each of the patch size categories.



	1-100	101-250	251-500	501-1000	1001-2500	2501-5000	5001-10000	10001-20000	>20,000
Mean	0.610	0.147	0.074	0.050	0.041	0.024	0.021	0.016	0.017
Start	0.573	0.238	0.088	0.047	0.026	0.017	0.005	0.005	0.000
End	0.601	0.230	0.057	0.045	0.033	0.023	0.008	0.001	0.003

Figure 20, Young forest patch size class distribution at plan start and plan end compared to the SRNV mean.

LTMD projection shows movement towards the target level (SRNV mean) in the following patch size categories: 1-100, 101-250, 1001-2500, 2501-5000, 5001-10000, and >20,000. Movement away from the SRNV occurs in the following patch size categories: 251-500, 501-1000, 10001-20000.

In general, selection of preferred harvest area was focused on creating large contiguous disturbances and fewer disturbances of <250 ha to cause movement towards the SRNV mean of the larger disturbance size classes (<1000 ha). In general, movement was made towards the desired levels of these larger class sizes (except the 10001-20000 ha category), however, the SRNV levels were not achieved by the end of the planning period (2031). Although efforts were made to aggregate harvest, meeting the SRNV in larger patch sizes categories will likely need to occur over multiple planning terms.

3.7.4.3 Management Objective 5

To provide a sustainable, predictable, and economical supply of wood products that are required by wood processing mills dependent on the Nagagami Forest.

3.7.4.3.1 Indicators 5.1-5.11 Long term available harvest area

The target and desired level for this indicator is to achieve an available harvest area greater than or equal to Term 1 in the short (Term 2), medium (Term 3), and long term (T11). Table 8 shows the AHA (ha/year) for the LTMD across terms 1,2,3, and 11.

Table 8, Available harvest area across forest units for the short, medium, and long term.

PLANFU	T1	T2	T3	T11
BW1	27	-	-	-
LC1	406	333	-	1,135
MW1	87	102	278	440
MW2	7	79	688	740
PJ1	71	0	255	37
PJ2	843	268	63	46
Po1	1,045	892	586	118
PWR	-	-	-	1
SB1	231	99	481	922
SF1	195	325	89	3
SP1	597	1,075	531	24

In general, this indicator is not achieved, which is expected as there was no consideration in the LTMD solution to maintain the T1 harvest area in any other term. Additionally, the age class structure of the forest causes a sizable drop in Available Harvest Area over the planning horizon, particularly after term 6, which makes achieving this objective even more challenging.

Lack of achievement of this indicator is not detrimental to forest diversity management objectives, however it will have implications for receiving facilities that consume a specific product (e.g. veneer), as product recovery rates can vary considerably between forest units.

3.7.4.3.2 Indicators 5.23-5.28 Long-term Projected available Harvest volume

The projected use levels for SPF volume is met in the short (2031), medium (2041), but not the long term (2121). Additionally, several shortfalls exist throughout the planning horizon (T3, T4, T7, T8, T9, T10, T12, T13, T14). These shortfalls are strongly influenced by the age class structure of the forest, which causes unavoidable decline in volume achievement. These shortfalls were an important consideration during operational planning and during the development of future FMPs.

There is currently no market for poplar products volume except for strong demand for veneer (committed volume = 33,000m^3/year). To meet this demand, and based on current recovery levels, the total available Po volume needs to be 1,750,000m^3, which is not achieved in any term throughout the planning horizon. Additionally, the age class structure of the forest causes a sharp decline in poplar volume from T1-T6 due to natural succession, causing even lower levels of achievement. Achievement of the poplar volume indicator will need to continue to be given due consideration in future FMPs to ensure receiving facilities are able to maintain a sustainable wood supply.

3.7.5 Spatial Assessment of Projected Harvest Areas

As required by the 2020 FMPM, the first 4 periods of harvesting were projected according to the final model solution obtained during stage 2 (Portrayed on map product: MU390_2031_FMPDP_MAP_DistHarv_00). The preferred and optional areas identified for the 2021-31 FMP were aggregated in areas that avoid remote tourism zones in order to reduce access pressure in these areas. Future planning terms will need to access these areas to maintain wood supply demands. Additionally, the discontinuous zone contains a sizable amount of eligible forest that was not accessible during the 2021-31 FMP due to harvest level constraints. This zone will provide eligible harvest area that will contribute to the achievement of volume targets in future planning cycles.

The spatial distribution of harvest areas among subunits was assessed to ensure each subunit contains an appropriate proportion of the AHA relative to its size over the planning horizon. Table 9 lists the six distinct strategic management zones along with their associated area paratmeters.

Table 9, Area distribution among all six SMZs (per BMI version: JUN0320)

Subunit	Total BMI area	Total Available area at plan start (ha)	Total production forest at plan start (ha)
A	10,655	9,449	4,473
B	1,004	853	853
C	3,957	3,777	3,136
D	24,722	14,010	12,563
DISCON	50,781	41,631	24,753
MAIN	356,874	305,651	143,276

Table 10, proportion of area across strategic management zones (per BMI version: JUN0320)

Subunit	Total BMI area	Total Available area at plan start (ha)	Total Production forest at plan start (ha)
A	2.4%	2.5%	2.4%
B	0.2%	0.2%	0.5%
C	0.9%	1.0%	1.7%
D	5.5%	3.7%	6.6%
DISCON	11.3%	11.1%	13.1%
MAIN	79.7%	81.4%	75.8%

The 2021-31 FMP is in the second term of the 'A' DCHS schedule blocks (online from 2011-31), meaning the model was instructed to harvest as much of this area as is needed to create future even aged forest structure within this SMZ. The remaining area was balanced between the discontinuous and 'MAIN' strategic management zones.

The discontinuous caribou zone is intended to satisfy the CCP in relation to improving north-south connectivity between the northern continuous range and the Lake Superior caribou population. To achieve this, landscape classes that may enable temporary occupancy by caribou (IOP, MOC, and MOLC) in this zone were emphasized (i.e. tracked as a working group in the model solution within the DISCON SMZ). Minimum harvest levels were created to increase the harvest area in this zone in the solution, with due regard for the above-mentioned Landscape class objective. Additionally, maximum harvest limits were implemented at the direction of the MNRF northeast region planning biologist. These harvest limits are as follows:

- *PJ1: 5 ha/year*
- *PJ2: 55 ha/year*
- *PO1 60 ha/year*

These harvest area constraints prevented the allocation of much of the discontinuous zone, as a considerable portion of the eligible area available for forest management is PJ2 and PO1.

The caribou planning direction received during the LTMD ultimately led to less harvest area being allocated in the Discontinuous zone than was identified as preferred during stage 2 of the LTMD. As a result of this direction, the area allocated within these zones is disproportionate compared to the respective production forest totals (i.e. proportions of production forest in Table 10 depart from the proportion of the LTMD AHA shown in Table 12). For this reason, the harvest within the discontinuous zone represents about 8% of the AHA, which is below what would be expected given the proportion of the productive land base it occupies. The remaining areas selected for harvest occur within the main subunit. Overall, the balance of harvest area in T1 does not appear to be unbalanced.

Over the planning horizon, considerable shifts in harvest area occur among subunits. These shifts can mostly be attributed to the DCHS zone, as more harvest occurs in this zone when the larger DCHS blocks are online (i.e. 'A' and 'B' blocks).

Table 11, AHA across Strategic management zones over the 150-year planning horizon

Term	Main	DCHS	Discon	TOTAL	DCHS blocks online
Term 1	29,549	3,372	2,160	35,081	A
Term 2	26,338	570	4,808	31,715	B
Term 3	27,132	7	2,567	29,706	B
Term 4	24,003	2,099	1,307	27,409	C
Term 5	26,609	235	4,305	31,148	C
Term 6	22,376	9,245	2,411	34,032	D
Term 7	24,229	114	1,898	26,241	D
Term 8	23,053	1,302	1,783	26,139	A
Term 9	16,584	439	1,292	18,315	A
Term 10	23,447	71	3,440	26,958	B
Term 11	31,438	527	2,688	34,653	B
Term 12	19,225	1,607	2,603	23,436	C
Term 13	14,403	702	597	15,702	C
Term 14	21,003	2,713	2,240	25,955	D
Term 15	15,158	1,376	1,081	17,615	D

Table 12, AHA Proportion across all strategic management zones over the 150-year planning horizon

Term	Main	DCHS	Discon	DCHS blocks online
Term 1	84%	10%	6%	A
Term 2	83%	2%	15%	B
Term 3	91%	0%	9%	B
Term 4	88%	8%	5%	C
Term 5	85%	1%	14%	C
Term 6	66%	27%	7%	D
Term 7	92%	0%	7%	D

Term	Main	DCHS	Discon	DCHS blocks online
Term 8	88%	5%	7%	A
Term 9	91%	2%	7%	A
Term 10	87%	0%	13%	B
Term 11	91%	2%	8%	B
Term 12	82%	7%	11%	C
Term 13	92%	4%	4%	C
Term 14	81%	10%	9%	D
Term 15	86%	8%	6%	D
Average among terms	86%	6%	8%	

The DCHS sees a sizable drop in harvest when B blocks are online, which is expected as the total area of the single 'B' block is only 1000.1 ha. A large portion of the AHA in T6 occurs within the DCHS, as the 'D' blocks are the largest. The balance between main and discontinuous SMZ shows significant variability over the planning horizon. This is largely due to the age class structure of both subunits, as they are both predominantly A95 forest cover. Since most of the forest occurs within the same age, the projected harvest area goes through ebbs and flows, resulting in variable harvest area over the planning horizon. Additionally, the DCHS subunit has highly variable available harvest area levels, depending on which DCHS blocks are online. When small DCHS blocks are online (i.e. 'B' and 'C'), the model compensates and typically allocates more area within the Discontinuous zone.

For these reasons, the harvest area is not evenly apportioned between the three SMZs over the planning horizon. Overall, the balance of area between the SMZs appears acceptable given the disproportionate amount of area within the A95 age-class and DCHS block size dynamics mentioned above.

This imbalance between the three strategic management zones does not appear to have a material impact on achievement of management objectives or the LTMD.

Preferred and optional harvest areas for the first 4 terms identified during stage 2 of the LTMD are displayed on "MU390_2021_FMPDP_MAP_DistHarv_00.pdf" (6.1(u) supplementary documentation).

3.7.6 Social and Economic Assessment

The FMPM requires the assessment of the long-term management direction (LTMD) and the impacts it may have on forest-sector employment and other forest-based industries. The socio-economic assessment is supported by the socio-economic description that describes the level of forest management on the Nagagami Forest, as well as the dependency of other resource-based industries on the Nagagami Forest.

This assessment will examine the impacts of the proposed management strategy in three areas;

1) Timber Volume Assessment

Average annual planned harvest volume between the 2011-2021 Nagagami FMP (2011 FMP), and the forecast volume for the 2021-2031 Nagagami FMP (2021 FMP) will be compared; direct employment and employment income related to the average annual planned harvest volume for the two plans will also be compared.

2) Silviculture Expenditures Assessment

Average annual planned renewal program expenditures between the 2011 FMP and the forecast program expenditures for the 2021 FMP will be compared; differences in expenditures between the two plans will be discussed, as will potential impacts on employment.

3) Non-Timber Impacts Assessment

The impacts that forest management activities may have on other forest-based industries will be discussed, as well as how negative impacts will be mitigated throughout the planning process.

Background

The Nagagami Forest is located within the Wawa District in the Northeast Region of the MNRF. The MNRF has designated the responsibility for forest management planning on the Nagagami Forest to Hornepayne Lumber LP (HLLP) through a Sustainable Forest Licence (SFL) (SFL #550047). First Resource Management Group Inc. (FRMG), on behalf of HLLP, carries out management duties on the forest which includes the preparation of the FMP, Annual Work Schedules, Annual Reports, and other related forest management documentation. FRMG is also responsible for completing renewal activities on the forest while overlapping licensees and harvesting contractors to HLLP carry out the harvesting operations on the forest.

The Nagagami Forest is within in the Boreal Forest Region. The SFL has a land base of 448,897 hectares of which 384,651 hectares is Crown managed productive forested land. The main tree species include jack pine, black and white spruce, poplar, and white birch, with minor components of balsam fir, cedar, larch, and red pine.

The major consumptive use of the forest on the Nagagami Forest is commercial timber harvest. The mills and other processing facilities that received products from the forest are summarized in the table below. The severe decline in the US housing market and subsequent forest industry mill closures has resulted in utilization below traditional levels. Table 13 summarizes the harvest volumes, by destination for the period between 2011 and 2018.

Table 13. Harvested volume from the Nagagami Forest, by product type and receiving facility between 2011-12 and 2018-19.

Receiving Facility	Total Volume of product utilization by year (m^3)								
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Atlantic Power Corporation (Hearst)								8,673	8,673
AV Terrace Bay Inc. (Terrace Bay)	593	12,171	16,404	7,480	7,691	5,971		9,996	60,307
Cyprien Lachance (Lachance Saw & Planer) (Val Cote)					107				107
EACOM Timber Corporation (Nairn Centre)						10,611			10,611
Hornepayne Lumber LP (Hornepayne)	86,225	143,938	169,639	148,261	69,069	51,823	165,235	210,386	1,044,576
Hornepayne Power Inc. (Hornepayne)				42,908	88,566	140,683	74,562	33,494	380,213
Levesque Plywood Limited (Columbia Forest Products Ltd.) (Hearst)	11,071	29,427	18,708	11,882	14,773	11,261	19,970	19,279	136,372
Longlac Lumber Inc. (Longlac)						1,575			1,575
Brushmat Material/Camp Construction/Bridge Construction)				337	389	365	846		1,937
Ontario (Personal Use Fuelwood)	500	429	545	560	367	210	197	189	2,996
White River Forest Products Ltd. (White River)						34,979		7,359	42,338
Total	98,389	185,966	205,296	211,427	180,964	257,478	260,810	289,376	1,689,706

Source: MNRF's Provincial Timber Scaling and Billings System

Under a Direct Licence, the Nagagami Forest supplies Hornepayne Lumber LP with SPF conifer sawlogs. The utilization of this volume at their Hornepayne sawmill accounts for the majority (62%) of the volume utilized in the 2011 to 2018 period. A Minister's supply agreement also directs 33,000 m^3/year of veneer quality poplar to Levesque Plywood Limited's (Columbia Forest Products) facility in Hearst, as per Appendix 'E' of the SFL. During the eight-year period, poplar veneer utilized at the Columbia facility, represents approximately 8% of the utilized volume.

In addition to these facilities, Hornepayne Power Inc. utilized 23% of the total volume. AV Terrace Bay Inc. and White River Forest Products Ltd. utilized 4% and 3%, respectively. As well, small volumes went to Atlantic Power Corporation in Hearst, EACOM Timber Corporation in Nairn Centre, Longlac Lumber Inc. in Longlac, Lachance Saw and Planer in Val Cote, as well was used for Personal Use Firewood and brushmat or other construction materials. The product breakdown of volumes utilized between 2011 and 2018 are as follows:

- Conifer Sawlogs – 64.4%
- Conifer Pulp – 4.2%
- Mixed Conifer and Hardwood (i.e., biofibre) – 23.0%
- Personal Use (i.e., fuelwood or building materials) – 0.2%
- Other (brushmat or other construction materials) – 0.1%

The Nagagami Forest is a primary contributor to the economic and social health of local communities. In addition to timber, it is managed for non-timber values that range from wildlife habitat and old

growth, to tourism, recreation, and trapping. With its high number of users and activities, the forest can be considered a multiple use forest.

3.7.5.1 Timber Volume Assessment

The Ontario Forest Accord Advisory Board (OFAAB) Benchmark data represents the long-term supply of wood necessary for industrial processing on the Nagagami Forest. Table 14 shows the comparison of the OFAAB volumes to those of the 2011 FMP and the current utilization of volume on the unit. The current demand is much lower than what is available in the 2011 FMP for all species. This can be attributed to the downturn in the forest industry. At the start of the eight-year period (2011-2018), the sawmill in Hornepayne was owned by Haavaldsrud. Due to the economic downturn sustained from the Great Recession of 2008, financial pressures led to the suspension of operations in late 2015, with the company eventually going into receivership in the spring of 2016. Since the purchase of the facility by Hornepayne Lumber LP, there has been a positive trend in SPF utilization, with full utilization of the annualized available harvest volume in 2018-19. Similar trends are being seen in the utilization of poplar veneer, however the overall utilization of both poplar and white birch has been well below available total volumes. Closures of OSB mills in Timmins and Wawa in the early 2000's have resulted in a diminished market for lower grade hardwood in the region, including both poplar and white birch.

Table 14. OFAAB Benchmark, 2021 FMP Available Harvest Volume and Current Utilization Volumes for Spruce-Pine-Fir (SPF), Poplar (Po), White Birch (Bw) and Other Conifer (OC).

Source	Volume (m^3)			
	SPF	Po	Bw	OC
OFAAB Benchmark	243,000	119,860	0	4,154
2011 FMP Available Harvest Volume	240,000	192,350	22,013	7,991
Current Utilization* (2011 to 2018 Annual Reports)	147,754	17,128	381	26

**Note: these numbers to not include utilization of volume by Hornepayne Power Inc. or Atlantic Power Corporation, classed as mixed biofiber, which is largely made up of mixed hardwood volume, as well as some mixed conifer volume.*

The comparison between the 2011 FMP and the 2021 FMP volumes is shown in Table 15 There is an increase in forecasted annual available harvest volumes for SPF, cedar and larch, and a decrease in the forecast poplar and birch volumes. The overall total increase in volume is 5.6%, therefore a qualitative assessment is provided as the difference is not large enough to significantly affect the stability of the dependent communities, forest mills or other stakeholders associated with the Nagagami Forest.

Table 15. Comparison of forecast annual available harvest volumes between the 2011-2021 and the 2021-2031 Nagagami FMPs

Species Group	2011-2021 FMP (m^3/year)	2021-2031 FMP (m^3/year)	Difference (m^3/year)
SPF	240,000	250,961	10,961
Poplar	192,350	145,212	(47,138)
White Birch	22,013	21,324	(689)

Cedar	4,000	5,473	1,473
Larch	7,991	17,384	9,393
Total	466,354	440,353	(26,001)

Source: Nagagami 2011 FMP; Table FMP-8, and Nagagami 2021 FMP; Table FMP-9

The increase in forecasted annual available harvest volumes can be attributed to several factors. The first is the development of updated and more representative yield curves using the Model Inventory Support Tool (MIST). As well, the 2021 FMP was developed using a new forest resource inventory, with updated stand ages, stocking, and species composition proportions. Additionally, the implementation of the Boreal Landscape Guide has an impact on which forest units are harvested (or retained) to meet required conditions.

The impacts of forestry on local employment have been examined between the 2011 and 2021 FMPs using census data available at the time of FMP development (2011 FMP – 2006 Stats Canada Census data; 2021 FMP – 2016 Stats Canada Census data). The 2011 FMP saw 13 communities that benefited from forestry on the Nagagami Forest including Constance Lake First Nation, Dubreuilville, Greenstone, Hearst, Hornepayne, Iroquois Falls, Kapuskasing, Marathon, Michipicoten (or Wawa), Sault Ste. Marie, Terrace Bay, Timmins and White River.

The current plan has only seven communities in the surrounding area who receive benefits from Nagagami Forest: Dubreuilville, Hearst, Hornepayne, Wawa, Schreiber, Terrace Bay and White River. The results are summarized in Table 4.

Table 16. Forestry employment figures for the Nagagami Forest

	2011 FMP	2021 FMP	Difference
Planned annual harvest volume (m^3).	1,403,485	1,554,518	(26,001)
Number of forest industry jobs	4,910	910	(4,000)
Average annual income	$55,067	$56,285	$1,218

Source: Nagagami 2011 FMP; Supp Doc 6.1.4, Table 2, and Nagagami 2021 FMP; Statistics Canada Census of Population, 2016

The significant decrease in forestry jobs between the two plans can be attributed to the economic downturn in the forest industry which saw several mill closures in communities such as Timmins, Iroquois Fall, Marathon and Sault Ste. Marie, all of which received some volume from the Nagagami. Despite the many mill closures the outlook for the forest industry is promising and is expected to remain stable.

The Nagagami Forest forecasted volume from the LTMD is illustrated in Table 5. For the 2021 period, the forecasted volumes for all species meet or exceed the OFAAB benchmark and current FMP volumes, except for poplar. The 2021 poplar volume exceeds the OFAAB benchmark but falls short of what was available in the first 10-years of the 2011 FMP. However, the projected volume for all periods exceeds the current utilization levels. Even with an increasing trend in utilization, it is expected that the forecast volume will meet the needs of local mills now and into the future.

The long-term projected volume of SPF and white birch fall below the 2011 FMP available volumes (i.e., first 10-years) in some periods, which is largely due to the current age class structure and the requirements of the Boreal Landscape Guide. The poplar volume is also less than what has been available historically. Again, this shortfall is related to the current age class structure, in combination with the application of the Boreal Landscape Guide.

Table 17. Projected Available Harvest Volume by Species Group

Species	Annual Volume (m^3/year)					
	2021	2041	2061	2081	2101	2101
SPF	250,961	216,000	240,000	233,524	189,154	240,000
Poplar	145,212	117,622	95,274	134,138	108,652	88,008
White Birch	21,324	28,936	17,390	16,256	10,368	20,568
Cedar	5,473	3,422	3,101	1,861	1,582	15,564
Larch	17,384	10,478	10,798	941	5,802	60,417
Total	440,353	376,458	366,562	386,721	315,558	424,746

Source: FMP-9

3.7.5.2 Silviculture Expenditures Assessment

Table 18, illustrates the difference in silviculture spending between the previous FMP and that of the current FMP.

Table 18. Comparison of planned annual silviculture expenditures between the 2011-2021 FMP and the 2021-2031 FMP for the Nagagami Forest.

	2011-2021 FMP	2021-2031 FMP	Difference
Planned annual silviculture expenses ($ '000s)	1,502.3	1,645.4	+ 143.1

Source: Nagagami 2011 FMP; Table FMP-20, and Nagagami 2021 LTMD (SFMM)

There is a ten percent increase in the projected levels of silviculture spending in the 2021 Nagagami FMP as compared to the 2011 FMP. This difference can be attributed to several factors, including an overall increase in the available harvest area, and thus silviculture treatment area, as well as an increase in treatment costs plan over plan. There may also be a slight reduction in the amount of natural regeneration relative to artificial regeneration in the 2021 FMP compared to the previous plan. This is likely the result of the reduction in mixedwood forest units being harvested and treated (which would have a significant natural regeneration component), compared to the 2011 FMP, combined with an increase in the harvest of pine forest units (predominately PJ2) which are typically artificially regenerated. This increase in artificial regeneration is also contributing to an increase in costs in the 2021 FMP.

3.7.5.3 Non-Timber Impacts Assessment

Forestry operations have the potential to both positively and negatively impact other resource-based users. Some of the impacts of forest activities on other forest-based industries are described in Table 19. The table also provides some of the mitigative efforts to either decrease the potential negative impacts or to ease the planning process.

Table 19. Impacts of forest management on non-industrial forest activities.

Sector	Activity	Impacts
Recreation & Tourism	Tourism outfitters	Use management strategies for roads on the Nagagami Forest have been developed to address land use direction around remote tourism lakes, but these strategies, which often included decommissioning of operations roads, are not always supported by those who favor increased access on the forest. Use management strategies are often contentious and may not satisfy all resource users, however best efforts are made to mitigate concerns through the planning and public consultation processes. Harvesting activities can disturb the natural aesthetics of an area in the short term while a new forest is re-established, and this may affect the business of tourism operators. Efforts will be made to address this issue through the RSA, planning and public consultation processes.
Recreation & Tourism	Hunting	Access roads are generally positively accepted by hunting enthusiasts because increased access equates to increased hunting opportunities. Road closures are generally negatively accepted because they restrict new hunting opportunities in specified areas. In some cases, enthusiasts may not appreciate increased access because it is perceived to increase hunting pressure (rather than spread pressure out across the landscape) and this may eventually ruin the hunting experience in a certain area. This will be addressed through the planning and public consultation processes. Habitat protection and creation through forest management activities helps promote the sustainability of key game species such as ruffed grouse and moose. Habitat levels projected in the FMP are derived through modelling with the input of MNRF habitat biologists and approved by the planning team and LCC.
	Fishing	Compared to hunting, access roads are generally a more contentious issue with fishing enthusiasts. For those who rely heavily on access roads to enjoy the sport, increased access to new lakes is viewed favorably. For those who enjoy the challenges and rewards of fishing inaccessible areas, increased access is not desirable because it may diminish fish stocks in prized waters. These concerns will be mitigated to the extent possible through the planning and public consultation processes. Harvesting practices have the potential to create deleterious effects on fisheries if carried out inappropriately. These potential impacts, including sediment deposition, spills or the destruction of shoreline cover are mitigated

Sector	Activity	Impacts
		through the use of AOCs , adherence to legislative and regulatory requirements and through sound logging practices.
	Cottages	New forest access roads can be perceived as beneficial or disruptive, depending on whether cottage owner's desire enhanced access. While making it easier to access their cottage, roads also can have the effect of attracting more people to the area. Access strategies around cottage areas will be addressed through operational planning and public consultation processes. The effects that harvesting has on natural aesthetic values in cottaging areas are generally perceived as negative and will be mitigated through operational planning and public consultation processes.
	Eco-tourism	Increased access to areas providing ecotourism opportunities would most likely be perceived as positive so long as aesthetic features are not impacted. Details of access around ecotourism features will be determined through the LCC and public consultation opportunities. Harvesting activities are generally perceived as having a negative impact on ecotourism because of the impact on aesthetics and perceived damage to ecotourism features. Recognized ecotourism features are protected in operational planning; harvesting plans potentially impacting other ecotourism features will be discussed through the LCC and public consultation opportunities.
Mining, Aggregate & Power Generation	Mining	Road access created by forest management activities is generally perceived positively; prospectors can more easily access claims and road use agreements can potentially be negotiated between the SFL holder and the mining industry. Harvesting operations can also improve areas for mining sampling and mapping. Some negative impacts include the potential removal of mining survey lines and destruction of claim posts by forest harvesting activities.
	Aggregates	Forest management activities will serve to create additional access to aggregates.
	Power generation	Additional or improved access for hydro generation activities is provided through forest management. The co-generation facility in Hornepayne directly benefits from the bio-fuel harvested from the forest, and the residues produced by the sawmill.
Other	Traplines	Forest management activities may result in increased or refurbished access which can assist trappers in accessing their lines. New access may disturb wildlife, draw in the public, and not be considered favourable by a trapper. Access in trapline areas is addressed through the LCC, public consultation opportunities, direct discussions with trappers and operational planning. Forest management activities may create wildlife habitat (*e.g.* beaver habitat) which benefits trappers; however, forest management will also convert habitat to younger seral stages immediately after operations are completed. Habitat

Sector	Activity	Impacts
		management through forestry activities is addressed through the LCC, public information sessions, and operational and strategic planning.
	Baitfish operators	Increased access caused by forest management is generally perceived positively by baitfish operators because of the access they gain to baitfish lakes.
	BMAs	Additional road access caused by forest management can be perceived positively or negatively; increased access may be appreciated by hunters, but it may also result in reduce bear habitat. Forest management activities may also negatively affect BMA holders because bears may change their baiting habits in the face of new disturbances. Concerns around specific forest operations can be addressed through public consultation process and operational planning.

Conclusion

Fluctuations in the timber and silviculture assessments have been noted and correspond with fluctuations in the market conditions of the forest industry in the last decade. Improvements in wood supply and silviculture activities demonstrate positive and stable changes in the socio-economics of the local communities that rely on these benefits from the Nagagami Forest.

The non-timber impacts assessment shows the potential effects of forestry on trapping, recreation, tourism, and mining. The largest factor to mitigating impacts is through public consultation with First Nation and Métis communities, members of the public, the Local Citizen Committee, and representatives from other industries.

3.7.7 Risk Assessment

There are risks that some plan objectives may not be fully achieved during the implementation of the FMP, which can impact the future forest condition and desired benefits. Impacts may affect social, economic, or environmental values, alone or in combination.

As experienced during the last FMP, the Great Recession of 2008 had a remarkable impact on FMP's. During this period, the level of utilization had seen historically low harvest levels, especially in some forest types and planned harvest blocks located furthest from mills. Global markets, economies and international trades have a direct effect on the successful implementation of this FMP. Several scoping scenarios evaluated the historical harvest levels and its related implications to objective achievement.

Climate change could also pose a potential risk to the implementation of the Nagagami FMP. The health and condition of the forest affected by severe climate events could have implications in the achievement levels. Larger and more frequent wildfires, weather patterns (e.g., strong winds, wet autumn conditions, late freeze-up or early winter thaws) may pose a risk to achieving objectives in the

FMP. The FMP uses an adaptive management approach by monitoring the implementation of the FMP, which influences current achievement levels but subsequent planning decisions.

Spatial pattern objectives are directly influenced by actual harvest levels. Although historical harvest levels are reasonable, some of the marginal forest stands that would require an intervention to improve their health and condition are often overlooked for economic reasons. Reduced harvest levels will increase the amount of area in these marginal forest stand condition on the management unit and reduce the opportunities to meet spatial pattern objectives.

The overall risks of successfully implementing the FMP are mitigated by the selection of a well-balanced management strategy. The management strategy is then supported by monitoring the FMP to ensure the planning team adapts to the changing economic environment, societal needs and the everchanging and unpredictable climate.

Risk assessment results indicated that continuing historic utilization levels (per the year-7 AR) for the 2021-31 FMP would not have a material impact on forest cover diversity objectives but would cause considerable changes in volume achievement during the early terms of the plan, particularly term 1. Refer to analysis package section 7.15.1 for complete results of the risk assessment.

4.0 PLANNED OPERATIONS

4.1 Introduction

Section 4.0 details the operations planned for the 10-year forest management plan. The following sub-sections describe prescriptions for operations, including harvest area and volume, renewal and tending operations, roads planning, silvicultural expenditures, and monitoring and assessment of operations. Finally, the planned operations are compared to the strategic levels in the approved LTMD.

4.2 Prescriptions for Operations

4.2.1 Operational Prescriptions and Conditions for Areas of Concern

An area of concern (AOC) is defined as a "geographic area established for an identified value that may be affected by forest management activities" (FMPM 2017). To prevent, minimize or mitigate any potential adverse effects of forest management activities to an identified value, detailed AOC prescriptions have been developed. The area within an AOC have operational prescriptions that may vary from those identified for normal operations. AOC planning is completed on all areas subject to forest management operations, including harvest blocks, silvicultural treatments, planned access and aggregate extraction areas.

Non-timber values (herein referred to as "values") to be protected on the Nagagami Forest are identified and shown on a series of values maps. These maps are derived from data stored and maintained by the MNRF in the Land Information Ontario (LIO) database. Values data are updated periodically throughout the year to include newly discovered values or to correct inaccurate information.

The AOC prescription includes a description of the identified value that the AOC will protect and the operational prescription for road access, harvest, renewal and tending activities. The AOC prescription will also include a monitoring program if required. All this information can be found in Table FMP-11; Operational Prescriptions for Areas of Concern and Conditions on Roads, Landings, and Forestry Aggregate Pits.

The values and associated AOC prescriptions described in Table FMP-11 are mapped on 1:20,000 scale forest operations maps. A typical AOC prescription will consist of a reserve and/or a modified operations zone. A reserve area is considered Crown productive forest in which forest management activities are prohibited. Depending on the value, AOC prescriptions may allow a controlled crossing of a reserve area, provided proper adherence to applicable policy and legislation. Modified management zones prescribe a modified approach to implementing normal forest management activities. For example, a modification to the level of harvest, timing of operations, or conditions on road construction are just three of the types of modifications to forest management activities that could be prescribed within a modified zone.

The planning team, with input from the LCC, developed AOC prescriptions using direction from the Crown Land Use Policy Atlas (CLUPA), approved forest management implementation manuals, on-site information, resource-based tourism operator input, and public consultation. First Nation and Métis communities have open seats on the Planning Team but have not contributed to the planning of AOC prescriptions thus far. Prescriptions for AOCs that address confidential or classified values specifically identified by First Nation and Métis communities are labelled appropriately and not shown on public FMP maps. Locations of such values are only provided to necessary personnel (e.g. woodlands manager or line-runner) and are not shown on public FMP products without the approval from the associated community.

More detailed information regarding management prescription options, analysis of options, and the selection of the preferred option for each AOC determined by the planning team (rather than governed by MNRF guidelines or direction)is located in the AOC Supplementary Documentation 6.1 (j).

No exceptions to provincial guidelines are proposed for prescriptions for AOCs in Table FMP-11.

4.2.1.1 Operational Prescriptions and Conditions for Areas of Concern Information Products

The information product associated with operational prescriptions and conditions for areas of concern will identify:

a) the area of concern identifier; and
b) the area of concern type.

The areas of concern information products include:

- MU390_21AOC001.E00 – (APAs)
- MU390_21AOC002.E00 – (Nests)
- MU390_21AOC003.E00 - (Unknown small stick nests)
- MU390_21AOC004.E00 - (RHZ 1,2,3)
- MU390_21AOC005.E00 - (RTM1, RTO1)
- MU390_21AOC006.E00 - (RTM2)
- MU390_21AOC007.E00 - (RTO2)
- MU390_21AOC008.E00 - (Viewsheds)
- MU390_21AOC009.E00 - (CRA)
- MU390_21AOC010.E00 - (RW and PK)
- MU390_21AOC011.E00 - (LP)
- MU390_21AOC012.E00 - (CO)
- MU390_21AOC013.E00 - (CAB)
- MU390_21AOC014.E00 - (PSP, PGP, and MSIM)
- MU390_21AOC015.E00 - (CALV)
- MU390_21AOC016.E00 - (CWA)
- MU390_2021_FMP_MAP_Index_00 – Index Map 23
- MU390_2021_FMP_MAP_Ops 620543 to 710543 –

Operation Maps. For identified bridging areas, the operational prescriptions, and conditions for areas of concern follow the direction in the 2011-2021 FMP.

4.2.2 Prescriptions for Harvest, Renewal and Tending Areas

4.2.2.1 Silvicultural Ground Rules

Silviculture Ground Rules (SGRs) document all approved silvicultural treatments that can be used to maintain or regenerate a specific forest unit, through harvest, renewal and tending actions, into the desired future forest unit. The SGRs identify a unique set of prescribed treatments (Harvest, Site Preparation, Regeneration, Tending) as the documentation includes the "Most Common Treatment Package" with the remaining possible treatments documented as "Acceptable Alternative Treatments". Table FMP-4 contains 39 SGRs for the Nagagami Forest. The prescriptions for harvest, renewal and tending presented in FMP-4 will serve as the prescriptions for operations (including naturally depleted areas that are salvaged) for the 10-year period of the FMP.

The SGRs in Table FMP-4 reflect the silvicultural options described in the base model (Section 3.3 of this document) used for scoping and for the determination of the selected management alternative. The renewal standards associated with each SGR also reflect the developmental information and renewal costs detailed in the model. Likewise, the associated species compositions, average stocking, and site class assumptions associated with each yield/intensity curve (i.e., stratum) are consistent with modeled assumptions.

The development of the SGRs was also influenced by the analysis of silvicultural activities and past performance (Sections 3.3.1 and 3.3.2 of this document). As part of an adaptive management approach, the experience gained during the implementation of past plans, provide important insight into treatment costs, effectiveness, and outcomes. This is important information that was included when creating model assumptions for post renewal succession (Table FMP-5) and the prescribed treatment packages shown in Table FMP-4.

The SRGs that will most commonly be used to regenerate each stratum (per LTMD solution) are as follows:

BW1-000-**PO1**
LC1-000-**LC1**
MW1-000-**PO1**
MW2-000-**MH2** (or MC2 depending on species comp of original stand)
PJ1-150-**PJ1**
PJ2-121-**PJ1**
PO1-000-**PO1**
SB1-000-**SB1**
SF1: equal portions of SF1-000-SF1 and SF1-000-SP1 in LTMD solution
SP1-000-**SF1**

The most common treatment packages listed in Table FMP-4 for each SGR will be the most likely treatment and represent the best estimate of proposed operations at the time of FMP preparation. Identifying the most common treatment will not limit the selection of any other acceptable alternative silvicultural treatments in the SGRs at the time of implementation of operations and will be guided by the actual site conditions encountered. The document titled Prescriptions for Harvest, Renewal and Tending, and Conditions on Regular Operations located in Supplementary Documentation 6.1 (q) provides more specific direction on the Forest Operations Prescription process.

The use of prescribed burning is an alternative site preparation that may be applied in specific situations. Currently, there is one area identified for a potential prescribed burn (Block Nagagami 120), however a prescribed burn plan has not been developed for this site. Should the proposed area be selected for a prescribed burn, it will be identified in the Annual Work Schedule and a prescribed plan developed for approval by MNRF.

Areas identified for aerial chemical tending or site preparation will be identified annually in the Annual Work Schedule and are subject to approval by the MNRF. In addition, Ministry of the Environment, Conservation and Parks approvals are required prior to the aerial application of any registered herbicide on the Forest. All products used in the FMP must be approved and registered by Health Canada's Pest Management Regulatory Agency (PMRA) under the authority of the federal Pest Control Products Act.

The information products for harvest, renewal and tending operations will serve as the stand list.

No exceptions to the guides or silvicultural trial areas are planned in this forest management plan.

4.2.2.2 Conditions on Regular Operations

Forest areas within the Boreal forest are harvested using the clearcut silvicultural system. Removal of most, or all the forest canopy emulates natural disturbance (primarily forest fire) and is compatible with the ecological requirements of boreal species. However, concerns raised about the protection of soils and advanced tree regeneration on some sites during forest operations have led to important changes in harvest methods. Careful logging around advanced growth (CLAAG) harvest methods intended to protect the desired established tree regeneration and organic soils, is conducted during winter when the soil is frozen. These sites, although still managed under the clearcut silvicultural system, retain significant amounts of trees and may be mistaken as a modified section harvest system. Over the years it was suspected that where the organic soil layer is > 30 cm thick, that careful logging was suspected to favor paludification (contribute to the creation of peatland) and to reduce black spruce forest productivity (Fenton et al. 2005; Lavoie et al. 2005b). The reports of declining productivity following careful logging initiated an important and ongoing research program focusing on the effects of specific silvicultural treatments on stand productivity for sites prone to paludification. The objective of this research is to identify silvicultural treatments most likely to mitigate paludification-prone sites and maintain forest productivity (Bergeron et al. 2007; Fenton et al. 2009).

4.3 Harvest Operations

4.3.1 Harvest Areas

The total planned harvest area for the 10-year term of the FMP are based on the Available Harvest Area calculated in the LTMD solution. Planned harvest areas were selected using the criteria detailed in Section 3.7.3 to ensure that harvest blocks are feasible and support the management objectives in Section 3.6.

The total Available Harvest Area and the total Planned Harvest Area by age-class for the ten-year period is shown in Table FMP-12. The areas shown exclude areas within AOC reserves, thus represent total area available for harvest. Note: 20 ha of Pr precommercial thinning is scheduled for the 2021-31 FMP, but due to its insignificance, this volume was not accounted for in the LTMD solution. Table FMP-13 shows the planned harvest volume by species for each forest unit. Table 20 (below) provides summary harvest area and volume information derived from Tables FMP-12 and 13.

Table 20 Summary of AHA and Planned Harvest area and volumes by forest unit.

			Net merchantable Harvest Volume (m^3)	
PLANFU	**LTMD Available Harvest Area (ha)**	**Planned Harvest Area (v97)**	**Conifer (all products)**	**Hardwood (all products)**
BW1	272	264	6,859	20,012
LC1	4056	4,053	315,291	8,507
MW1	870	865	70,657	56,290
MW2	73	72	3,632	3,586
PJ1	709	709	106,797	6,190
PJ2	8427	8,416	1,101,569	138,925
PO1	10445	10,440	294,578	1,369,379
PWR	0	-	-	-
SB1	2310	2,309	183,336	2,022
SF1	1950	1,902	158,192	25,003
SP1	5970	5,970	605,049	81,996
TOTAL	***35,081***	***35,001***	2,845,960	1,711,909

**Note the above chart does not include projected volume from planned Pr commercial thinning (20 ha)*

The planning of harvest operations is an iterative process of operationally locating feasible harvest areas across the forest to meet a strategic Available Harvest Area (AHA) calculated from a non-spatial model (SFMM).The strategic management strategy prescribes the 'optimum' forest unit and age-class distribution of the operational allocations based on non-spatially explicit inputs and constraints. Since SFMM does not adequately consider spatially explicit objectives (e.g. road building, landscape guide coarse filter, or stand and site guide fine filter habitat management), it is necessary to evaluate these objectives against the planned operations using both the Ontario Landscape tool (OLT) and the Evaluate Forest Residual Tool (ERFT) in order to ensure congruency with the applicable policy direction. The spatial assessment results are detailed in Section 3.7.4.2 of this document.

When the EFRT tool was run on the planned allocations, the initial results indicated that the current harvest pattern (existing pattern plus the planned operations) on the landscape required additional residual planning to meet spatial and temporal requirements of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales, (Stand and Site Guide or SSG), at the 500 ha scale. These residual shortfalls occurred within Blocks: 'Beaton 133', 'Beaton 142', 'Hiawatha 123', 'Hiawatha 124', 'Mozambik 120', 'Nameigos 125', 'Nameigos 126'. To address this finding a total of these blocks were reconfigured to include an additional 60.3 ha of planned unharvested residual.

Mapped allocations portray regular harvest area, contingency harvest area, and bridging Areas (on-going operations from the 2011 FMP).

Locations where personal-use fuelwood can be obtained will be identified in each Annual Work Schedule.

Planned harvest volume and anticipated levels of utilization are detailed in FMP-14 and described in Section 4.3.4.

The approval of this FMP is not an agreement to make harvest areas available to a licensee or licensee group.

4.3.3 Completion of On-going Harvest Operations from Previous Plan

Areas for bridging operations have been identified to allow for the continued harvest of areas from the 2011-2021 FMP to be carried over to the 2021-2031 FMP as per the revised direction in the 2020 FMPM. Candidate areas for bridging operations have been portrayed in accordance with the FIM and will be updated during the preparation of the final FMP.

Bridging areas do not contribute to the achievement of the 2021-2031 FMP available harvest area; therefore, this area will be summarized separately in the annual reports. Blocks have been identified and categorized by priority for bridging to be completed strategically and feasibly as blocks from the 2021-2031 FMP are scheduled for harvest within the same vicinity. It is important to note that the blocks being carried over from the 2011-2021 FMP will also carry forward their associated AOC planning and direction from the previous plan. For example, area of concern (AOC) prescriptions and operational road boundaries (ORB) from the 2011 FMP will apply to the blocks that have been identified for bridging. A separate set of stand alone maps for bridging blocks has been developed.

Table 21 Sum of Candidate Bridging Area by FU and Age Class

	Nagagami 2011-2021 FMP Briding Area (Ha) by Plan FU and Age Class												Grand Total
	BW1	LC1	MW1	MW2	PJ1	PJ2	PO1	PO3	SB1	SB3	SF1	SP1	
Bridging_1 (Priority Harvest)													
081-100			28.19			70.31	214.19	426.32					**739.00**
101-120		2.20		165.00	30.93	7.22	92.82	562.76	55.20		15.70		**931.84**
121-140			20.80	74.36					20.00			26.04	**141.19**
141-160		15.74							47.37	160.35		47.45	**270.91**
161-180										0.44			**0.44**
181-200											12.79		**12.79**
Bridging_1 Total		**17.95**	**48.99**	**239.36**	**30.93**	**77.53**	**307.01**	**989.08**	**122.57**	**160.78**	**28.49**	**73.48**	**2,096.17**
Bridging_2 (Less Desirable)													
081-100		26.42										24.88	**51.30**
101-120							20.98	83.30					**104.28**
121-140		0.52					77.72	28.81		12.27			**119.32**
141-160							53.32						**53.32**
181-200											6.78		**6.78**
Bridging_2 Total		**26.94**					**152.03**	**112.11**		**12.27**	**6.78**	**24.88**	**335.01**
Bridging_3 (Scheduled for Depletion in 2020)													
081-100			64.28	29.22		118.10		207.82					**419.42**
101-120				75.16		34.61		422.96	144.00	0.72	248.39	98.21	**1,024.05**
121-140	47.41	55.57		246.85				84.71	85.66	84.06	103.68	62.82	**770.76**
141-160	28.96	78.70		19.44				16.52	173.51	262.72	110.17	42.26	**732.27**
161-180									28.77				**28.77**
Bridging_3 Total	**76.37**	**134.26**	**64.28**	**370.67**		**152.71**		**732.01**	**431.94**	**347.50**	**462.24**	**203.29**	**2,975.27**
Grand Total	**76.37**	**179.15**	**113.27**	**610.03**	**30.93**	**230.23**	**459.04**	**1,833.20**	**554.51**	**520.55**	**497.51**	**301.66**	**5,406.45**

Blocks that have been scheduled for depletion during the preparation of this FMP were assigned a "Bridging_3" status to ensure that they could be carried over and accounted for if harvesting does not occur. It is anticipated that much of the Bridging_3 area will be harvested before the implementation of the 2021-2031 FMP. A single harvest block (Block 1052) with a relatively small area (53.94 Ha) within the Bridging_3 area has been identified as second-pass harvest. Second pass harvest areas do not contribute to the achievement of harvesting the available harvest area of the new FMP. An estimate of the volume associated with second-pass harvest is 1, 092 m^3, which can be further broken down by species:

- PO = 588.8 m^3
- SB = 282.8 m^3
- SW = 86.4 m^3
- BW = 69.6 m^3
- BF = 48.8 m^3
- CE = 15.6 m^3

4.3.5 Harvest Volume

Table FMP-13 shows the total net merchantable available harvest volume determined from the LTMD is 4,544,895 m^3 with an estimated 955,599 m^3 of undersize and defect volume. The planned net merchantable harvest volume for the 10-year period is 4,557,869 m^3 with an estimated 944,147 m^3 of undersize and defect volume.

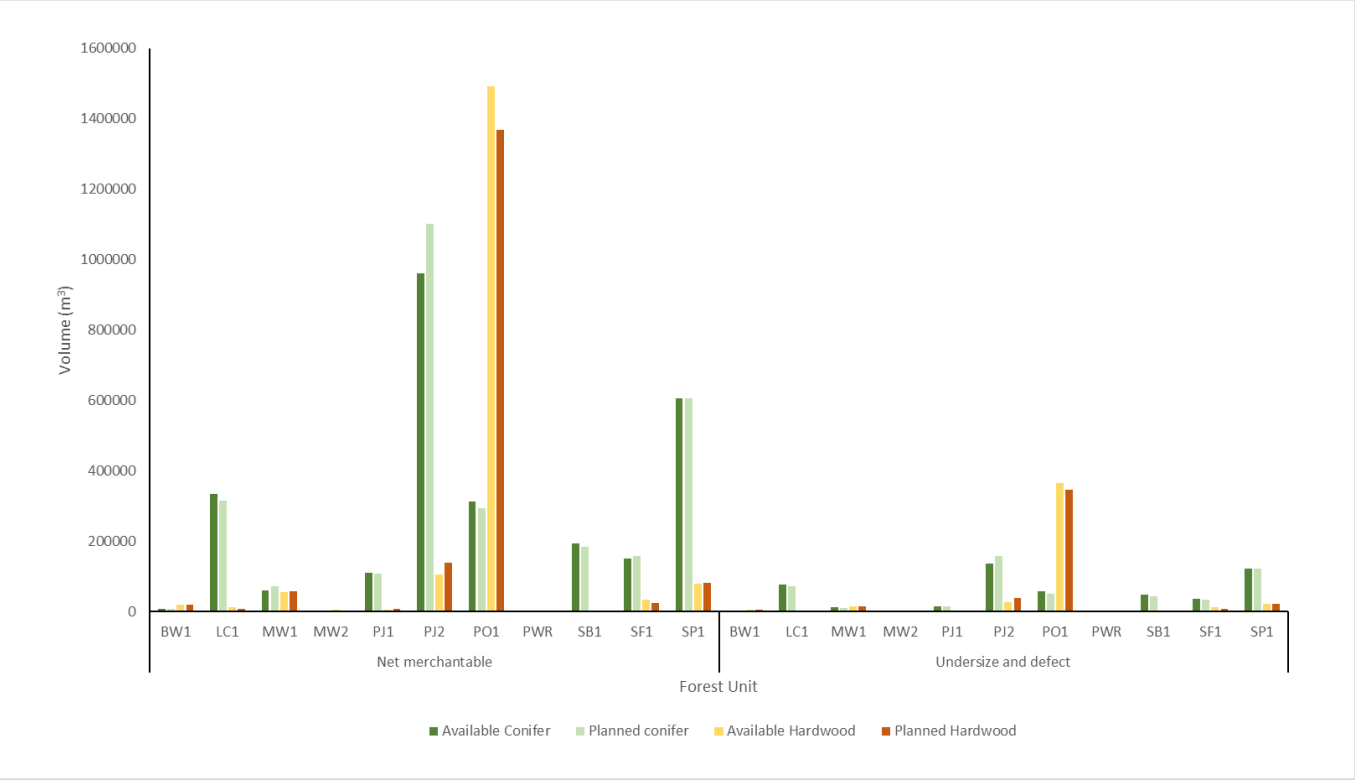


Figure 21, Net merchantable and undersize and defect volume for the LTMD projection (PMS14) and planned operations (v97).

Table FMP-14 summarizes the planned net merchantable harvest volume by species for the 10-year harvest allocations. The purpose of the table is to provide a tabular comparison of the planned utilized and unutilized available harvest volume by product group.

Volume estimates are based on the Modelling Inventory Support Tool (MIST) output, which assigns volume to each stand within the BMI. Individual volume estimates are projected for each stand using the stand volume generator in MIST. This generator considers stocking, site class, age and species composition for each individual stand, that in aggregate, provides a more accurate estimate of planned volume than the sustainable forest management model can project. This is because SFMM simply calculates the product of the total calculated AHA and the weighted average condition for an entire forest unit, while MIST calculates the volumes for each allocated stand and then provides a sum total for the 10-year allocation. The output provided by the stand volume generator is the more accurate method of assessing total planned volume and was thus used to generate the values in FMP-13, FMP-14, and FMP-15.

Overall, the variance observed between SFMM and the MIST volume generator did not negatively impact wood volume achievement as planned volumes satisfy wood supply commitments in the same manner as the strategic analysis. Further discussion on utilization is presented in Section 4.3.6, below.

4.3.6 Wood Utilization

Shifts in markets and utilization is an economic reality that will influence the development of the LTMD. The yield curves or growth projections have been developed to represent current utilization standards and provide separate estimates for yield of net merchantable and undersized and defect volume. Undersize and defect is based on the 2011 MNRF unmerchantable calculation tool, which utilizes regional standard net down factors for each forest unit. In addition, historic wood utilization has been considered in setting harvest level objectives, indicators, and targets. The risk assessment detailed in the analysis package also includes an investigation of recent wood utilization (e.g., last 10 years) and other identified risks, and an evaluation of the potential implications on the achievement of management objectives (refer to section 7.15.1 of the analysis package for full results).

Projection of planned harvest volumes are based on the following product proportion assumptions:

Table 22, Product proportions applied to each species group

Species	Veneer	Sawlog	Pulp/other
All conifer spp.		80%	20%
Po	16%		86%
Bw	2%		98%

The anticipated wood utilization of the planned harvest volume for the 10-year period by receiving facility is as follows:

Table 23, Committed volumes and anticipated utilization for all receiving facilities.

Receiving facility	Committed volume	Anticipated planned volume utilization
Hornepayne Lumber	100% of SPF volume	253,243 m^3/year
Columbia Forest Products	33,000 m^3 of Po veneer	21,756m^3/year
Becker co-generation plant	25,000 m^3 of SPF, Po, Bw, Ce, La biofibre (i.e. undersize and defect)	25,000 m^3/year

**4,131 m^3 of Bw veneer and 381 m^3 of Pr (all products) are identified as available for the open market.*

The committed volume of veneer calculated in the supply agreement between Columbia Forest Products (Hearst) and MNRF is not met for the FMP period. The shortfall observed in the polar species group is due in part to the differences between the 1990 inventory (FRI) and the 2008 eFRI. The proportions of poplar are much lower than projected in the 1990 inventory, there by reducing the projected poplar volume. Additionally, the trends in wood flow for Po species group are consistent with projections in the 2011 FMP, which trend downward for the next 5-6 terms.

This underachievement of poplar veneer targets does have implications for wood volume and delivered costs for the Columbia Forest Products Hearst facility. In order to achieve 33,000 m^3/year of veneer at 2021 projected recovery rate, a total of 2,062,500 m^3 of Po volume is required to satisfy the

supply agreement target. The forest is unable to produce enough Po volume to satisfy this target in any term over the 150-year planning horizon.

The projected utilization for SPF volume (per the Nagagami management unit available wood report June 2019) is 2,400,000 m^3 is met for the 2021-31 FMP.

The planned available harvest volumes that are more than the projected utilization have been identified as unutilized in Table FMP-14. The projected wood utilization by mill has been summarized in Table FMP-15. Table FMP-14 identifies unutilized volumes in:

- *Ce, La, OC Sawlogs and pulp (250,441 m^3 + 62,705 m^3)*
- *Po, Bw, and OH pulp/other (1,490,212 m^3)*

The above unutilized can be primarily attributed to the lack of a viable market for pulp (All spp.) and OSB grade hardwood.

Projected unutilized harvest volumes remain available for utilization to support industrial proposals. There are no specific commitments identified over and above the requirements of industrial wood requirement. The most significant change since the 2011 FMP is the closing of the Weyerhaeuser OSB mill in 2011, which effectively eliminated the market for all OSB grade fibre. Additionally, the Becker co-generation facility has been added as a receiving facility for bio-fibre. The projected consumption for this facility is much lower than that of the previous plan and does not include pulp (2011 = 103,000 m^3/year biofibre; 2021 = 25,000 m^3/year biofibre).

Underutilization driven by challenging market conditions has been a recurring issue during the implementation of the 2011 plan. If the underutilization of the available harvest area continues, the management objectives related to economic outlooks, social elements, and forest diversity will not move towards their respective targets at the rate predicted in the LTMD of the 2021 FMP.

Direction for utilization during periods of greatly reduced market conditions is provided by the MNRF, Northeast Region in Supplementary Documentation 6.1 (s), Northeast Region Operations Guide for Marketability Issues (2020). Block-specific direction associated with this strategy will be provided in the applicable Forest Operations Prescriptions. Implementation of the Modified Utilization Strategy will be confirmed with each Annual Work Schedule, as required due to market conditions.

The approval of this FMP is not an agreement to make areas or volume available for harvest to a particular licensee, or an agreement to supply wood to a particular mill, but rather an identification of the wood available for market, and the fibre demand associated with the Forest.

4.3.7 Salvage

Currently there are no plans to undertake any salvage operations during the 2021-2031 plan period. However, if a natural disturbance event occurs on the Forest that warrants a salvage harvest operation

an amendment to the FMP will be considered. A salvage amendment would include an updated FMP-14 to include the additional natural depleted area and estimated salvage volume by species.

4.3.8 Contingency Area and Volume

Unforeseen circumstances such as spring freshet conditions, blowdown, wildfire, insect damage or disease may cause some of the planned harvest area to become unavailable for harvest during the ten-year period of the FMP. Circumstances related to operational constraints and limited markets may also render planned harvest area as functionally unavailable. To accommodate such circumstances, approximately two years of AHA, by FU have been identified as contingency harvest areas , which is intended as replacement area for lost harvest opportunities. Identified contingency areas may be later proposed as regular allocation harvest areas in the next FMP. The contingency areas are identified and portrayed on the operations maps of the Plan. AOC planning has been completed for contingency blocks in order to facilitate expedited amendment approval.

Contingency areas were selected spatially across the forest to support opportunities for all the licensees. In general, contingency areas were located near existing roads or adjacent to proposed allocations to allow for operational feasibility. Due to the restrictions associated with allocating PJ1, PJ2, and PO1 area within the discontinuous SMZ for regular harvest, a sizable amount of contingency area had to be allocated to meet the 2-year AHA for PJ2. for this reason, a disproportionate amount of contingency area was allocated within the discontinuous SMZ, relative to the main SMZ.

FMP-16 details the amount of contingency area by forest unit and age class with associated conifer and hardwood volumes. The total contingency harvest volume equals 949,289 m^3 which is comprised of both conifer (softwood) and hardwood volumes of 607,806 m^3 and 341,483 m^3, respectively. There are 6,998.6 ha of contingency area identified in the plan.

This total contingency area represents approximately two years (6,998.6 / 35,081 = 19.95%) of the AHA.

Contingency area is included in the harvest information products.

4.3.9 Harvest area information products

Harvest area information products define the spatial or map information included in the plan. Information products associated with all the harvest areas identify and portray the following:

- The harvest block identifier
- The silvicultural system
- The harvest category (regular, bridging, second pass, salvage or contingency)
- The operational prescriptions for areas of concern (AOC)
- The silvicultural ground rule (SGR)
- If applicable, stand level residual requirements

The harvest area information products include:

- MU390_21PHR00.E00 – Planned Harvest
- MU390_21FDP00.E00 – Forecast Depletions
- MU390_21PCI00.E00 – Planning Composite Inventory
- MU390_21PRP00.E00 – Planned Residual Patches
- MU390_21AOC001.E00 – (APAs)
- MU390_21AOC002.E00 – (Nests)
- MU390_21AOC003.E00 - (Unknown small stick nests)
- MU390_21AOC004.E00 - (RHZ 1,2,3)
- MU390_21AOC005.E00 - (RTM1, RTO1)
- MU390_21AOC006.E00 - (RTM2)
- MU390_21AOC007.E00 - (RTO2)
- MU390_21AOC008.E00 - (Viewsheds)
- MU390_21AOC009.E00 - (CRA)
- MU390_21AOC010.E00 - (RW and PK)
- MU390_21AOC011.E00 - (LP)
- MU390_21AOC012.E00 - (CO)
- MU390_21AOC013.E00 - (CAB)
- MU390_21AOC014.E00 - (PSP, PGP, and MSIM)
- MU390_21AOC015.E00 - (CALV)
- MU390_21AOC016.E00 - (CWA)
- MU390_2020_FMP_MAP_Index_00 – Index Map
- MU390_2020_FMP_MAP_Ops 620543 to 710543 – Operation Maps.

It is important to note that harvest area portrayed in the MU390_21PHR00.E00 – Planned Harvest layer does not account for AOC reserves. Reserve areas must be removed to calculate actual available harvest areas (AOCTYPE = R in the AOC layer).

4.4 Renewal and Tending Operations

4.4.1 Renewal and Tending Areas

The analysis of past silvicultural activities and performance (described in Sections 3.3.1 and 3.3.2 of this document) provided the foundation for the planned renewal and tending operations. The projected and planned levels of renewal and tending operations associated with harvesting and natural disturbances are summarized by treatment in FMP-17. The treatments in the table are consistent with the expected implementation rate of each acceptable alternative silvicultural treatment in the silvicultural ground rules (FMP-4). The planned levels of renewal and tending (FMP-17) and associated expenditures (FMP-19) are required to achieve the objectives described in the FMP.

All possible areas that may be eligible for renewal and tending operations during the 10-year term of the FMP are shown on the summary and composite map for renewal, tending, and tree improvement. The areas shown on the maps include:

- all areas selected for harvest during the 10-year plan;
- all areas previously harvested or naturally disturbed during the current or previous FMPs and not yet renewed and/or not yet declared established; and
- all areas which may require pre-commercial thinning

From Table FMP-17, the planned treatments include:

Regeneration
Natural = 20,328 ha.
Artificial - Planting = 12,081 ha
Artificial - Seeding = 1,000 ha

Site preparation
Mechanical = 9,978 ha
Aerial chemical = 2,485 ha

Tending
Aerial chemical = 14,670 ha

Supplemental
Planting - 1,836 ha

The planned treatments in Table FMP-17 were used to develop the requirement for seed and planting stock (Renewal Support, Section 4.4.2 of this document) and, in association with costs for each treatment, to develop the planned expenditures table (Table FMP-19). These renewals and tending levels reflect full utilization of the planned harvest area for the ten-year plan. Less than full utilization will result in lower actual implementation levels than planned, but appropriate treatments will be applied according to the area of each forest unit harvested. The above values were calculated based on the renewal treatment proportions of the SFMM solution applied to the planned harvest area by forest unit. These values do not account for renewal of bridged harvest area, second pass, and unregenerated harvest area from the 2011 plan. It is noted that at the time this FMP was being produced, the new management contractor also undertook an update to the silviculture records and a liability assessment, including an aerial survey, in 2020. This information was not ready to be fully incorporated into the plan, and for this reason an amendment to table FMP-17 may be required in the 1st or 2nd year of plan implementation.

Information products associated with all areas scheduled for renewal, tending, and protection are submitted with the annual work schedule (AWS).

No silvicultural trial areas are being planned at this stage in the FMP.

4.4.2 Renewal support

Table 24, Seedling Requirements for the 2021-31 FMP based on the renewal proportions assigned in the LTMD solution.

Species	Stock Type	Number of trees required	Seeds required	Volume of cones (hl)
Sb	Nursery stock	3,593,571	7,187,142	36
Sb i	Improved stock	746,244	1,492,489	7
Sw	Nursery stock	1,445,836	2,891,671	14
PJ	Nursery stock	15,840,153	31,680,305	264
PJ i	Improved stock	1,140,596	2,281,192	19
Pr	-	-		
Pw	-	-		
Grand total	-	22,766,399	45,532,799	341

**40,000 seeds per hectare are required to satisfy scheduled Pj planting treatments.*

Renewal support includes estimates of the number of trees required for planting and number of seeds required for aerial seeding in each seed zone for the duration of the plan, as well the number of cones that would be required to be collected to meet those estimates. The SFL is a member of the Northeast Seed Management Association (NeSMA). A cooperative venture between MNRF and regional forest industry partners to undertake forest resource genetic management.

The tree seedling requirements were calculated according to the renewal proportions assigned in SFMM. Assuming harvest and renewal of the full 10-year allocation, 22.8 million trees would be required to fulfill the projection of the Planned Harvest Area (Table 24).

Currently, there are no tree improvement areas on the Nagagami forest. However, as a NeSMA partner the SFL draws improved seed from partner orchards throughout northeast region.

4.5 Roads

4.5.1 Primary and Branch Roads

All information products pertaining to construction of new primary roads, branch roads and operational roads for this 10-year planning horizon can be found in the following locations:

Section 6.1 (i) of the Supplementary Documentation contains the following:

- The environmental analysis of the alternative corridors for each new primary and branch road corridor and the rationale for the selected corridor and associated use management strategy.
- The primary and branch roads that will have access restrictions and/or road responsibility transfers implemented during the 10-year period.

Section 6.1 (u) of the Supplementary Documentation has maps showing the locations of all primary and branch road corridors.

Table FMP-18 lists all existing roads, identifies Primary, Branch and Operational Road Boundaries (ORB's) planned for construction and identifies any associated access controls along with the management intent of the roads.

As per the 2020 FMPM, planned primary and branch roads are portrayed as 1 km wide corridors within which the road will be located and constructed. Road construction may take place anywhere within the approved corridors with consideration to AOCs and any unavailable areas inside the corridors, e.g. AOCs with road restrictions and direction from the CLUPA.

Forestry aggregate pits and landing areas for road right-of-way volumes may also be developed within the corridors. All road construction in these proposed corridors will follow the conditions laid out in Supplementary Documentation Section 6.1 (q) of this plan, including where the road or landing does not intersect an area of concern.

All roads, sections of roads and networks transferred to the MNRF will be in a decommissioned state, unless otherwise defined in Table FMP-18 and the Road Use Management Strategy. A protocol for transferring road responsibility is found in Supplementary Documentation 6.1 (w). As per MNRF Transfer of Forestry Roads Responsibility, a transfer plan will be created for each road network being transferred to the MNRF.

4.5.2 Primary Roads:

Primary roads provide principal access for the Forest and are constructed, maintained, and used as part of the main road system. The planned primary road corridors are 1000 metres in width and will access harvest areas and allow for access to conduct silviculture treatments for the next 10 years. The roads are intended to provide long term access to future harvest areas and are normally considered permanent. The maximum road right of way allowance for constructed primary roads is 50 meters.

Listed in Table 25 (below) are the primary roads and the approximate length of new construction to be done during the implementation of this 10-year plan. Approximately 83 kilometers of new primary road construction is planned for the 10-yr period. Land use planning guidelines and the associated access controls have all been documented in section 6.1 (i) of the Supplementary Documentation.

Table 25. Summary of Planned Primary Roads to be Constructed

Primary Roads	Plan Start Length (km)	Planned Construction 10 Year (km)
Road 300	19.8	1.9
Brechenridge South	0	9.6
Hornepayne Creek	2.7	11.5
Bobcat Road	5.1	6.3
Irving East Road	0	4.9
Lynx Road	12.78	5.9
Manx Road	15.7	10.6
Franx Road	0	5.2
Mileage 17 Creek Road	4.92	7.9
Haken Lake Road	18.8	1.2
North Foch Road	6.09	6.6
Pichogen Road	0.00	11.30
	85.89	82.9

The long-term strategy for harvest, renewal and monitoring of the forest must consider the entire available land base, and the development of road access needs to compliment the spatial distribution of planned and future allocations. The road networks, as defined in section 6.1 (i) of the Supplementary Documentation, require long-term access, hence the need for continued primary road development. Planned road development is undertaken in the FMP to ensure there is an economic balance of roads and harvest areas that are well distributed, thus avoiding areas of the forest that would otherwise accumulate as disproportionately large amounts of higher-cost allocations in the future. There are no proposed primary road responsibilities being transferred to the Crown.

4.5.3 Branch Roads:

Branch roads are roads other than primary roads that branch off an existing or new primary or other branch road, providing access to, through or between areas of operations on a management unit. The planned branch road corridors are 1000 metres in width and are intended to provide long term access to future harvest areas for a period beyond the 10-year FMP term. The maximum road right of way for constructed branch roads is 40 meters.

Table 26 lists the branch roads and the approximate length of new construction to be done during the implementation of this 10-year plan. Coincidentally there is also approximately 83 kilometers of new branch roads planned for construction. None of the new branch roads or sections of new branch roads are proposed to be transferred to the Crown during the 10-year planning period.

Table 26. Summary of Planned Branch Roads to be Constructed

Primary Roads	Plan Start Length (km)	Planned Construction 10 Year (km)
Miriam Lake Road	1.12	4.12
Haig Loop	0.00	3.16
Mask Road	3.00	2.60
Rangifer Road	1.60	2.80
Pody Road	1.20	1.83
Hiawatha West Road	0.00	3.52
Nagagami Road	3.06	4.03
Hiawatha East Road	0.00	2.30
Wicksteed Road	0.00	8.00
Loon Lake Road	0.80	9.53
Hart Lake Road	2.23	2.50
Soup Road	0.00	6.58
Jackfish Road	0.00	6.60
Seguin Loop	3.50	9.98
Breckenridge South	0.00	3.10
Shamrock North Road	3.86	1.14
Stoney Creek	0.70	5.00
Little Fraser Road	2.60	1.40
Whitehorse Road	0.00	5.00
	23.67	**83.18**

4.5.4 Operational Roads

Operational roads are contained within a defined operational road boundary and provide short term access for harvest, renewal and tending operations. An operational road boundary is the perimeter of the planned harvest area plus the area from an existing road or planned road corridor to the harvest area within which an operational road is planned to be constructed. New operational roads planned for construction in this plan period must be within an operational road boundary. Operational roads are normally not maintained after they are no longer required for forest management purposes and are often decommissioned in accordance with land use direction or direction for moose emphasis areas (MEAs). The maximum road right of way allowance for operational roads is 30 meters, or 20 meters through an AOC

Each operational road boundary, within which an operational road will be constructed, and the associated use management strategy for the road(s) is recorded in Table FMP-18. All road construction in these proposed operational road boundaries will follow the conditions laid out in Supplementary Documentation 6.1 (q) of this plan.

Documentation of the use management strategy for each operational road or networks of operational roads is included in Supplementary Documentation 6.1 (i). Where the use management strategy restricts public access, the rationale for the restriction is also provided in this supplementary documentation.

4.5.5 Area of Concern Crossings - Primary and Branch Roads

To access the approved harvest allocations, many primary and branch roads need to cross through areas of concern (AOCs) due to terrain conditions or when no other reasonable alternative exists for the location. In general, to minimize the impact on the value the intent is to cross within the modified portion of the AOC and not the reserve portion, wherever possible or feasible.

Road construction and landings through an AOC must adhere to the direction in the Operational Prescriptions for Areas of Concern found in Table FMP-11. AOC conditions must be followed within the Operational Road Boundaries (ORBs). The AOC prescriptions and the conditions on construction for each individual AOC and road (or landing if applicable) are in Table FMP-11.

For each new operational road water crossing, the location, crossing structure and conditions on construction will be finalized in the applicable annual work schedules in accordance with the Ministry of Natural Resources and Forestry/Fisheries and Oceans Canada Protocol for the Review and Approval of Forestry Water Crossings. When possible, this will be completed a year ahead of time. Public comments specific to operational road AOCs are included in the Supplementary Documentation of the plan section 6.1 (j).

4.5.6 Area of Concern Crossings - Operational Roads

To access the approved harvest allocations, many operational roads will need to cross through (AOCs due to terrain conditions or when no other reasonable alternative exists for the location. In general, to minimize the impact on the value the intent is to cross within the modified portion of the AOC and not the reserve portion, wherever possible or feasible.

Operational road construction and landings through an AOC must adhere to the direction in the Operational Prescriptions for Areas of Concern found in Table FMP-11. AOC conditions must be followed within the Operational Road Boundaries (ORBs). The AOC prescriptions and the conditions on construction for each individual AOC and road (or landing if applicable) are in FMP-11.

For each new operational road water crossing, the location, crossing structure and conditions on construction will be finalized in the applicable Annual Work Schedules in accordance with the Ministry of Natural Resources and Forestry/Fisheries and Oceans Canada Protocol for the Review and Approval of Forestry Water Crossings. When possible, this will be completed a year ahead of time. Public comments specific to operational road AOCs are included in the Supplementary Documentation of the plan 18 section 6.1 (j).

4.5.7 Existing Roads

Table FMP-18 lists the existing primary and branch roads, as well as the operational road networks. This table also identifies the road responsibility with the responsibility normally assigned to either the SFL or the MNRF. Responsibility includes the monitoring of road conditions and addressing potential or existing personal and environmental hazards on the roads. This responsibility includes the closing of roads where safety or environmental hazards exist. When the forest industry is responsible for a road, ongoing monitoring, maintenance, and emergency repair work will be prioritized to meet safety, environmental and industry operational needs. It should be noted that emergency repairs to roads and water crossings might not be restored in a timely manner if they are damaged or destroyed by unplanned events, such as a major storm. Also, there is no obligation, on the part of the Crown or the forest industry, to undertake maintenance or repair work on behalf of other users. These users may not have the resources to replace failed infrastructure and access to businesses or properties could be disrupted at any time.

There are no mandatory safety standards with respect to road maintenance, however, the responsible party should correct, when resources to do so are available, any identifiable or known hazardous conditions that could be encountered unexpectedly and have the potential for serious consequences (e.g. washouts or obstructions).

Users of all Crown forest access road networks on the Nagagami Forest will use roads at their own risk.

The associated road use management strategies can be found in Supplementary Documentation Section 6.1 (i). The transfer of road responsibilities between the forest industry and the MNRF will be in accordance with the use management strategy for that road/road network. Generally, roads no longer required by the industry for periods of five years or more will be considered by the forest industry for transfer. A protocol for transferring road responsibility is found in Supplementary Documentation 6.1 (w). As per MNRF Transfer of Forestry Roads Responsibility, a transfer plan will be created for each road network being transferred to the MNRF.

4.5.7.1 Road Information Products

For each existing road or road network that is the responsibility of the sustainable forest licensee and other existing roads that will be used for forest management purposes and which are shared responsibility, information products associated with road construction, maintenance, monitoring, access controls and decommissioning identify:

a) the corridors for primary roads (20 years);
b) the corridors for primary and branch roads planned for construction (10 years);
c) the operational road boundaries (10 years);
d) the areas of concern within the corridors for primary and branch roads, operational road boundaries, and the areas of concern that intersect existing roads;
e) the roads that will be maintained;
f) the roads and associated water crossings that will be monitored;

g) the segments of roads that currently have access controls and the segments of roads where new access controls are scheduled, and the type of access control activities; and
h) the segments of roads that will be decommissioned, and the type of decommissioning activities.

Information products associated with all areas scheduled for road construction, maintenance, monitoring, access controls and decommissioning portray:

a) the corridors for primary roads (20 years)
b) the corridors for primary and branch roads (10 years);
c) the operational road boundaries (10 years);
d) the areas of concern within the corridors for primary and branch roads, operational road boundaries, and the areas of concern that intersect existing roads;
e) the segments of roads that currently have access controls and the segments of roads where new access controls are scheduled; and
f) the segments of roads that will be decommissioned.

4.5.8 Road Water Crossings

The review and approval of the construction and decommissioning of water crossings will be in accordance with direction in the Ministry of Natural Resources and Forestry/Fisheries and Oceans Canada Protocol for the Review and Approval of Forestry Water Crossings (the Protocol). For each new primary and branch road water crossing to be constructed, the location, crossing structure and conditions on construction will be finalized in the applicable AWS (as per FMPM Part D, Section 3.2.5) in accordance with the Protocol.

Any approved water crossing standards from this Protocol that will be used during forest operations are documented in Supplementary Documentation Section 6.1 (q)

4.5.9 Forestry Aggregate Pits

Forestry Aggregate Pits (previously Category 14) are exempt from the requirement for an aggregate permit under the Aggregate Resources Act (ARA) as per the Exemption Criteria identified below.

<u>Exemption Criteria (2020 FMPM Section A 1.3.6.6</u>)

Under Section 8 of Ontario Regulation 244/97 made under the Aggregate Resources Act, a person who operates a pit while conducting forest operations on Crown land on behalf of the Crown or under the authority of a forest resource license and in accordance with a FMP approved under the CFSA is exempt from subsection 34(1) of that Act, as amended from time to time (i.e., the requirement for an aggregate permit to operate a pit). The following criteria will apply to a forestry aggregate pit:

a) the aggregate is required for a forest access road in a management unit;
b) aggregate is extracted:

a. no closer than 1.5 metres above the established groundwater table; or
b. closer than 1.5 metres above the established groundwater table if:
i. the proposed site is remote or isolated; and
ii. the excavation limit of the site is not within:
1. 500 metres of a coldwater stream;
2. 1000 metres of a waterwell, whether dug or drilled; and
3. 5000 metres of a receptor (e.g., residences or facilities where people sleep {nursing homes, hospitals, trailer parks, camping grounds}; schools; day-care centres).
c. the pit is established within:
i. an approved new primary or branch road corridor in the FMP, and identified in the AWS;
ii. an approved area of operations in the FMP, and identified in the AWS;
iii. an approved operational road boundary in the FMP, and identified in the AWS; or
iv. an approved aggregate extraction area in the FMP and identified in the AWS located within 500 metres of an existing forest access road.

Aggregate pits that satisfy these criteria are hereafter referred to as "forestry aggregate pits" (FAP).

Forestry Aggregate Pits must remain within the road corridor or operational road boundary that was identified in the AWS at the time the site was established. Refer to Supplementary Documentation 6.1 (q) Prescriptions for Harvest, Renewal and Tending, and Conditions on Regular Operations for the operational standards for Forestry Aggregate Pits.

A single planned aggregate extraction area has been planned outside of operational road boundaries for the term of the 2021-2031 forest management plan (identified in the "MU390_2021PAG00" layer).

4.5.10 Conditions on forestry aggregate pits Forestry Aggregate Pits

All existing forestry aggregate pits will be identified in each Annual Work Schedule (Part D, Section 3.3.4)

Per Appendix IV of the FMPM 2020, The following operational standards apply to the extraction of aggregate resources for forestry aggregate pits:

1. Topsoil and overburden, where present, must be stripped and stored on site.
2. Aggregate material may be removed only within areas where access, harvest, or aggregate extraction has been planned and approved, with no removal occurring within 15 metres of the boundary of any planned area.
3. Aggregate material must not be removed from an area of concern or within 15 metres of the boundary of an area of concern, except:
    a. for a cultural heritage landscape or historic Aboriginal value, as defined in the Forest Management Guide for Cultural Heritage Values, if,
        i. The operational prescriptions and conditions for the area of concern of *the FMP documents conditions on location, construction or use of the forestry aggregate pit, as per the advice of a qualified individual as defined by the Forest Management Guide for Cultural Heritage Values, and*
        ii. The aggregate material is removed in accordance with such conditions; and
    b. for all other values, if,

i. The operational prescriptions and conditions for the area of concern of the FMP documents conditions on location, construction or use of the forestry aggregate pit, and
ii. The aggregate material is removed in accordance with such conditions.

4. Notwithstanding standard 3 above, aggregate material must not be removed from an area of concern or within 15 metres of the boundary of an area of concern for the following values, as defined in the Forest Management Guide for Cultural Heritage Values
    a. archaeology site;
    b. cemetery; or
    c. archaeological potential area
5. When operating within 15 metres of a proposed roadside ditch, no excavation is to take place below the elevation of the planned depth of the proposed ditch; all excavations must be immediately sloped to no steeper than a 2:1 (horizontal: vertical) angle.
6. During extraction, no undercutting of the working face is permitted and:
    a. the working face must be sloped at the angle of repose; or
    b. the vertical height of the working face must not be more than 1.5 metres above the maximum reach of the equipment.
7. All trees within 5 metres of the excavation face must be removed.
8. The maximum pit area must not exceed 3 ha. When a pit or a portion of a pit is rehabilitated, it is no longer part of the pit.
9. When the site is inactive, all pit faces must be sloped at the angle of repose.
10. Within the excavation area, no ponding is allowed, and offsite drainage must be designed to prevent sediment from entering any water feature.
11. MNRF may direct that a forestry aggregate pit be rehabilitated where the responsibility for the road and associated forestry aggregate pit is being transferred back to MNRF.
12. Final rehabilitation must include:
    a. sloping of all pit faces to normally a minimum of 3:1 (horizontal: vertical);
    b. re-spreading of any topsoil and overburden that was stripped from the site; and
    c. mitigative measures, to the satisfaction of MNRF, to prevent erosion (e.g., establishment of vegetation).
13. Existing or proposed forestry aggregate pits within areas of concern, or in the vicinity of features that are addressed by conditions on operations, as described in MNRF's forest management guide(s) relating to conserving biodiversity at the stand and site scales, must not be constructed or operated except in circumstances as identified in the conditions on operations in the FMP. This includes any restrictions on the construction of new forestry aggregate pits and timing of aggregate extraction, rehabilitation, or other associated operations in existing pits.
14. Progressive rehabilitation of the site must be ongoing starting from the commencement of the forestry aggregate pit.
15. If a forestry aggregate pit has not been active for a period of five years and the sustainable forest licensee confirms that future use of the pit is not required, final rehabilitation must be completed in accordance with standard 12 above within 12 months of the sustainable forest licensee's confirmation.

Despite standard 15, if MNRF agrees that access to the pit that requires rehabilitation is not feasible within the 12-month period specified, MNRF and the sustainable forest licensee may agree, in writing, to a longer period.

If a forestry aggregate pit intersects an area of concern, FMP-11 identifies if there are any conditions on operations. Aggregate material must not be removed from an area of concern or within 15 metres of the boundary of an area of concern, except in accordance with the conditions described in FMP-11.

4.5.10.1 Aggregate Extraction Areas Information Products

Information products associated with aggregate extraction areas identify and portray (if included in the FMP):

1) the aggregate extraction area identifier; and
2) the areas of concern.

4.6 Expenditures

Table FMP-19 summarizes the projected expenditures for renewal and maintenance operations, and renewal support for the Nagagami Forest for the 10-year planning term. Average annual silviculture expenditure for full harvest utilization is $1.654 million.

The forecast of silviculture expenditures was derived using the planned level of treatments documented in Table FMP-17 and the associated renewal support forecasts documented in Section 4.2.2. Actual expenditures will depend on how much of each planned forest unit is harvested, and the associated costs required to meet commitments of renewing those forest units.

4.7 Monitoring and Assessment

4.7.1 Forest Operations Inspections

4.7.1.1 Annual Compliance Plan

The Nagagami Forest 10-year strategic compliance plan has been developed in accordance with the requirements of the Forest Compliance Handbook (2014), and MNRF's Forest Compliance Strategy (2007).

In general, the compliance plan describes where the Company will detail the methods, intensity, and frequency of forest operation prescriptions, circumstances for which inspections will be conducted, and the submission of inspection reports to the MNRF. The compliance plan provides further information and detail for unique situations, past, present, and anticipated compliance problems,

compliance goals, objectives strategies and expected results, corrective actions, inspection techniques, and roles and responsibilities. The compliance plan is in supplemental documentation section 6.1(r). A more detailed compliance plan, which is consistent with the 10-year strategic compliance plan, is developed annually and included as part of the Annual Work Schedule.

The Forest Operations Information Program (FOIP), which is a MNRF web-based program, will be used to document inspections, compliance issues and, if required, to track whether remedial actions have been completed.

4.7.1.2 MNRF Compliance plans

The MNRF forest compliance plans are part of the Wawa District Annual Compliance Operations Plans. The forest compliance plans are prepared in accordance with the Ontario Forest Compliance Handbook (2014). From the analysis, evaluation, and approval of the annual Nagagami Forest compliance components and operational activities, and from the review of past operations, MNRF Wawa District plan for the allocation of staff and resources to ensure compliance obligations are met.
An integral part of district compliance plans is the application of MNRF's risk analysis and management strategies related to its compliance monitoring of forest operations, as described in the Ontario Forest Compliance Handbook (2014). The focus for forest compliance planning is achieving the best risk management decision in the planning and allocation of forest compliance monitoring resources, given all other mitigating measures in place, so that an appropriate balance is struck among: minimizing the likelihood of non-compliant occurrences; minimizing the probability of the failure of monitoring systems to detect a non-compliance; and minimizing the amount of or adequately mitigating any loss or damage resulting from a non-compliance.

All compliance inspections are completed by MNRF certified compliance inspectors. The Forest Operations Information Program (FOIP), a MNRF web-based program, is used to document inspection results, including in compliance operations, operational issues, corrective actions taken, and remedies to address issues.

The Nagagami Forest Local Citizens Committee is provided, at each meeting, updates on forest operations, including compliance issues. Semi-yearly field trips often include looking at active and completed forest management projects and include discussions on forest compliance. Part of the presentation of the Annual Reports to the LCC includes the summary of forest compliance. In addition, LCC members are invited to participate in the Independent Forest Audits and Forest Stewardship Council certification audits.

4.7.2 Exceptions

The FMPM requires a monitoring program be prepared for any operational prescriptions contained in an FMP for AOCs or SGRs that are exceptions or that differ from specific direction provided in a forest management guide. The exceptions monitoring program describes methods that will be used to monitor the effectiveness of the operational prescription. None of the operational prescriptions

planned or SGRs for implementation under this FMP are exceptions to the approved forest management guides, therefore an exceptions monitoring program is not required.

4.7.3 Assessment of Regeneration

4.7.3.1 Establishment Surveys

A summary of the area, which will be assessed for the determination of free-growing achievement by forest unit, has been provided in Table FMP-20. HPL schedules an assessment on all areas that were currently regenerated (either naturally or artificially) a minimum of five years after harvest operations are completed. A total of *59,277* ha is planned for assessment during the ten-year period. This is an estimation of the area to be assessed by forest unit based on the following criteria:

- All areas currently treated and scheduled to be assessed within the course of plan implementation (actual)
- All areas remaining in the previous FMP that will be treated and eligible (forecast)
- All areas scheduled to be harvested during plan implementation and expected to be eligible to be assessed within the course of plan implementation (forecast)

Effectiveness monitoring is used to determine if management activities are producing the expected results. Effectiveness monitoring enables the forest manager to determine whether the current forest units are being changed to the desired forest units in the proportion described in the FMP. It also permits the forest manager to examine whether certain treatments are meeting expectations and, if they are not, to investigate why they were not successful as expected and make appropriate modifications in the future. Results of effectiveness monitoring analysis are used to adjust yield expectations and post-renewal succession in the development of FMP objectives.

Refer to Supplementary Documentation 6.1 (h) includes a detailed monitoring plan for assessment of the regeneration program. It includes the overall program objectives, the methodologies used for assessment, a description of the timing and duration of assessments, documentation, and reporting requirements and LCC roles and opportunities with the silvicultural effectiveness monitoring program.

A silvicultural exception monitoring program is not required for this FMP, as none of the proposed silvicultural treatments are exceptions to the recommendations identified in the silvicultural guides.

4.7.3.2 *Renewal monitoring*

The silvicultural treatments described in the SGRs include harvest and logging method, site preparation, regeneration, and tending. As these treatments are being implemented on the ground, a variety of quality control or performance measures are being implemented. These are described in detail in the Forest Renewal Monitoring Protocol, Supplementary Documentation 6.1 (h).

4.7.4 Roads and Water Crossings

Details of the water crossings and roads monitoring program that will be carried out for the 10-year period can be found in supplementary documentation 6.1 (g) Monitoring Program for Roads and water crossings. This document details the methods used to inspect the physical condition of roads and water crossings to determine if their area environmental or public safety concerns. Planned monitoring for each road and road network is described in FMP-18.

MNRF will continue to implement focused monitoring and compliance efforts on water crossing construction and decommissioning projects as per this FMP and associated AWSs, the requirements of the MNRF Forest Compliance Handbook, and the Ministry of Natural Resources and Forestry/Fisheries and Oceans Canada Protocol for the Review and Approval of Forestry Water Crossings.

4.7.5 Species at Risk

There is currently no monitoring program specifically developed for species at risk on the Nagagami Forest. Compliance with area of concern prescriptions or conditions on regular operations that have been applied to address species at risk will be monitored as a part of the regular compliance monitoring via the Forest Operations Inspection Program (Section 4.7.1). HPL employees, staff, operators, and their contractors are encouraged to report sightings of species at risk, so this information may be forwarded to the MNRF.

4.8 Fire Prevention and Preparedness

All forest operations on the Nagagami Forest will be carried out with careful consideration to the prevention of forest fires. It is recognized that accidental fires can have a larger impact on annual operations or timber sustainability than many harvest or silvicultural operations. Operators must also be prepared to safely take on initial actions to prevent fire spread, should a fire occur. In addition, operators must be aware of other prevention measures in the Forest Fires Prevention Act and associated regulations.

Under the authority of the Forest Management Planning Manual and the Crown Forest Sustainability Act, conditions are placed on forest operations through the Annual Work Schedule to provide for fire prevention and preparedness (e.g. operators must consult MNRF fire indices at appropriate intervals during activities).

4.8.1 Fire Emergency Contacts

The principal contact person(s) for each operation is identified in the Annual Fire Plan submitted as part of the Annual Work Schedule. It will be the responsibility of the company to provide the necessary contact information for all overlapping-licensees, contractors, sub-contractors, or other pertinent personnel to the MNRF as a part of the annual burn plan. It will be the responsibility of the company to identify and report any changes in these contacts. Changes in contact information must be forwarded to the MNRF fire management headquarters supervisor prior to the commencement of operations.

Digital files containing composite maps showing where harvesting, road construction/ maintenance and silvicultural activities are scheduled to occur during the year can be found in the spatial data associated with each Annual Work Schedule.

4.8.1.1 Fire Prevention

During periods of high fire danger, forest operations will be restricted or suspended according to the guidelines developed by the forest industry and the MNRF called "Modifying Industrial Operations Protocol 4 (2011)". This Protocol was developed to prevent forest fires during high hazard periods by prescribing when, and under what circumstances, operations would be subject to; Short Shift, Restricted Shift, Shutdown, or specific Prevention measures. Forest workers will utilize the MNRF's Forest Users Information phone line, website, or fire indices flow chart to find out the fire danger level for their areas and to determine what modifications to make to their operations.

The Modifying Industrial Operations Protocol will also provide an incentive for forest operators to become 'trained and capable' with respect to fire suppression, which allows them to operate under slightly higher fire danger conditions.

To be considered 'Trained & Capable', the following criteria must be met:

- ***Prevention:*** *Implementation of an effective prevention program for the type of operation, as outlined in the Fire Prevention and Preparedness Plans.*
- ***Suppression:*** *Minimum resource and equipment availability as identified in the Modifying Industrial Operations Protocol (Modifying Industrial Operations Protocol Section 1.2 Fire Suppression Equipment).*
- ***Communication:*** *The ability to communicate and report fires immediately and to receive or obtain updated information on the fire danger.*
- ***Immediately means*** *two-way radio or telephone capabilities from the site to the company or MNRF office.*
- ***Training:*** *A minimum of 25% of all staff involved in forest operations on a site must be trained to the MNRF SP-102 standard.*

Refresher training will be implemented on a regular basis to ensure all contractors are familiar with the SP-102 course content at the start of the fire season (typically occurs when operations resume following spring break-up). The Modifying Industrial Operations Protocol is also covered during HPL spring training sessions for Licensees and contractors as required.

A fire preparedness inspection will be completed for all operations by Licensees and contractors prior to the start of operations. Industry FOIP reports will be prepared by the company after operations start. The FOIP reports will describe compliance or any incidents of non-compliance with the requirements.

A fire preparedness inspection will be conducted by the company prior to start-up of renewal operations (tree plants, slash pile burning etc.). Silvicultural contractors will not be allowed to start until all requirements have been met.

All industry FOIP reports regarding fire compliance will include details outlining location, type and condition of the fire equipment.

All operations must be classified into one of 4 levels of operational risk: Low, (L) Moderate (M) High (H) or Very High (VH).

The company will work with forest workers to promote fire prevention awareness to other forest users during periods of high fire danger. Operations will be encouraged to post signs indicating the fire danger hazard levels on their operations.

Monitoring of activities during the fire season will focus on checking that the required fire suppression equipment is in place and ready to be used. Operators will check their required fire equipment daily prior to starting work. Attention will also be made to the storage of flammable fuels and the parking of equipment on mineral soil. Each operation should be visited once a month during the fire season. The overall success of a fire management program depends on quick response as soon as fire is discovered.

Forest workers will be made aware of their responsibilities to prevent fires, to start initial suppression and to report fires to the MNRF Aviation Forest Fires and Emergency Services (AFFES) Headquarters. Fires will be reported to the MNRF by phone at the emergency contact information identified in the Annual Work Schedule. Many contractors and individuals also have cellular phones and may directly report fires to the MNRF. Alternatively, contractors will report fires to the company who will forward the report to MNRF AFFES.

If a fire is discovered, Company and/or forest workers will take immediate action to start suppression and to report the fire to the MNRF. The Company and forest workers agree to keep track of the labour and equipment used until the MNRF takes over. The minimum required information to be reported to the MNRF includes:

a) discovery time of the fire
b) expected cause of the fire if known
c) location of the fire
d) size of the fire
e) access to control the fire
f) fuel types
g) other values in the area.

The annual fire plan submitted with the AWS will contain detailed operating procedures around normal operations and escalated fire operations. It will outline:

- Company, contractor and MNRF contact information
- Fire suppression equipment required
- Licensee fire training records
- Company and contractor equipment available for fire suppression activities

- Fuel keys and definitions related to modification levels to guide operations Nagagami Forest 2021-2031 Forest Management Plan.
- Standard operating procedures and good management practices related to fire prevention on the management unit.

4.9 Comparison of Proposed Operations to the Long-Term Management Direction

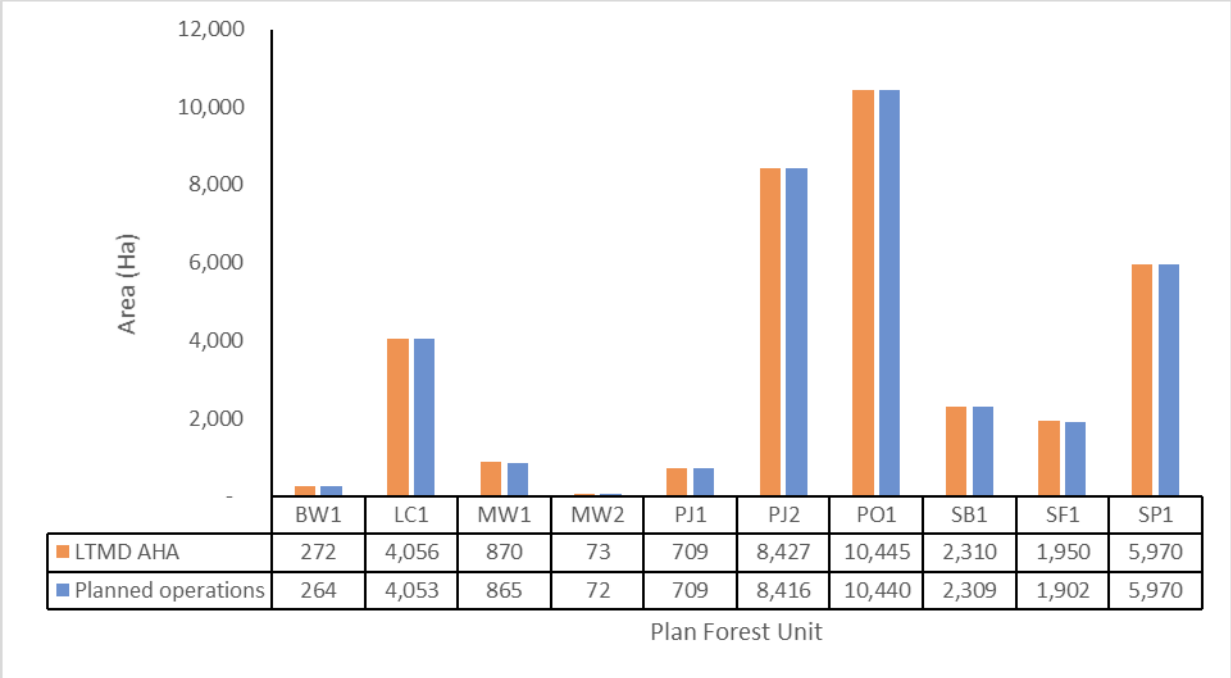
This section provides an assessment of the expected effects of planned harvest, renewal, and tending operations, and the spatial distribution of harvest areas on the progress towards meeting the management objectives of the LTMD.

Planned harvest areas are compared to the LTMD in two formats: the actual conditions from the allocated inventory stands relative to all eligible areas and the strategic model, and the long-term modelled allocations (A-1.3.9 SFMM run) to the strategic (LTMD) model.

4.9.1 Planned Harvest operations

4.9.1.1 Harvest Area

Figure 22, details the available harvest area for the LTMD and A139 modelling scenarios for term 1 of the planning horizon.



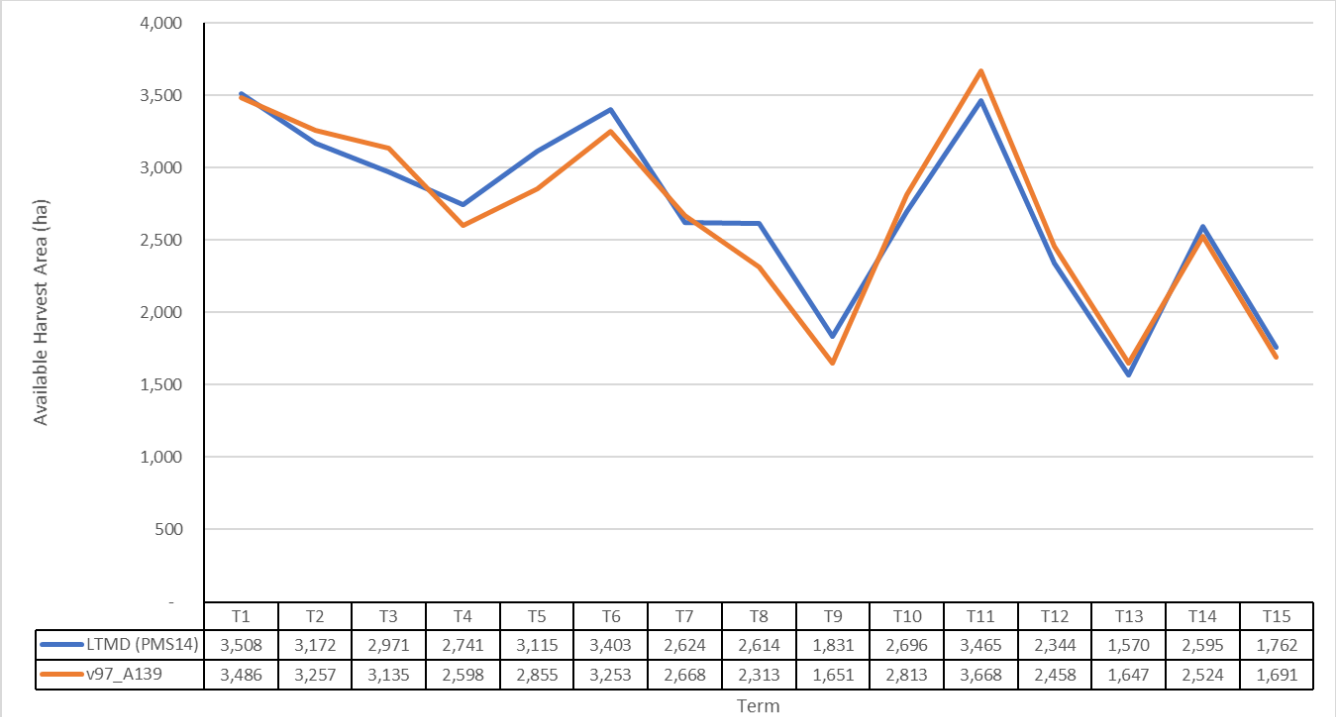
	BW1	LC1	MW1	MW2	PJ1	PJ2	PO1	SB1	SF1	SP1
LTMD AHA	272	4,056	870	73	709	8,427	10,445	2,310	1,950	5,970
Planned operations	264	4,053	865	72	709	8,416	10,440	2,309	1,902	5,970

Figure 22, LTMD 10-year AHA compared to Area allocated for planned operations (Version 97)

As described in section 4.3.1, the 10-year Available Harvest Area of the LTMD strategic solution served as a target for the selection of harvest areas. In total, 98.77% (35001 ha/35,081 ha) of the Available

Harvest Area was selected for planned operations. Each of the forest units showed modest shortfalls in planned harvest area relative to the LTMD AHA (0.02% to 2.75%).

Figure 23, shows the projection of total available harvest area for the LTMD and A139 projection across all terms of the 150-year horizon.



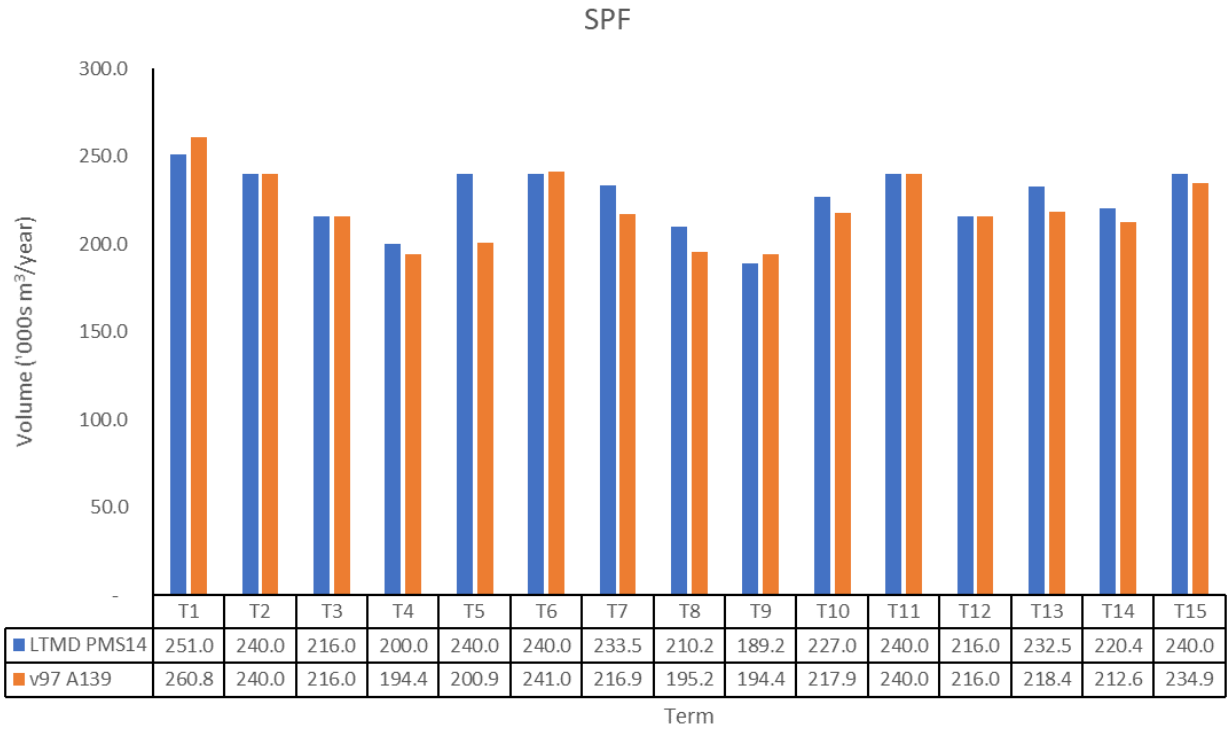
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
LTMD (PMS14)	3,508	3,172	2,971	2,741	3,115	3,403	2,624	2,614	1,831	2,696	3,465	2,344	1,570	2,595	1,762
v97_A139	3,486	3,257	3,135	2,598	2,855	3,253	2,668	2,313	1,651	2,813	3,668	2,458	1,647	2,524	1,691

Figure 23, Available Harvest Area for the LTMD and planned operations (v97) over the 150-year planning horizon.

The projection of Available Harvest Area for planned operations (i.e. A139 run) shows slight departure from the LTMD AHA in some terms (T3, T4, T5, T8, and T9), however the overall trend is reasonably consistent with the LTMD projection throughout the 150-year planning horizon. These discrepancies are not expected to have a material impact to the achievement of management objectives assessed during the LTMD

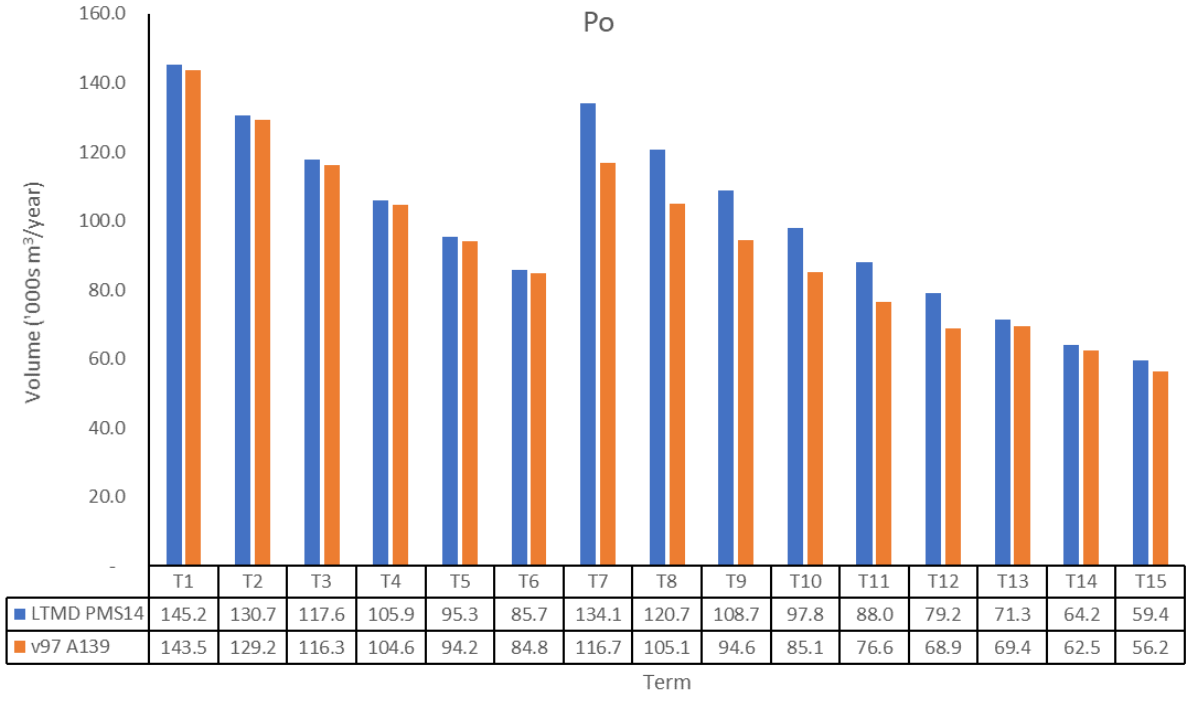
4.9.1.2 Harvest Volume

The following figures compare the projected volumes for the Planned Operations (i.e. A139 run) with the LTMD for the 150-year planning horizon. Annualized species group volumes are provided for each 10-year term.



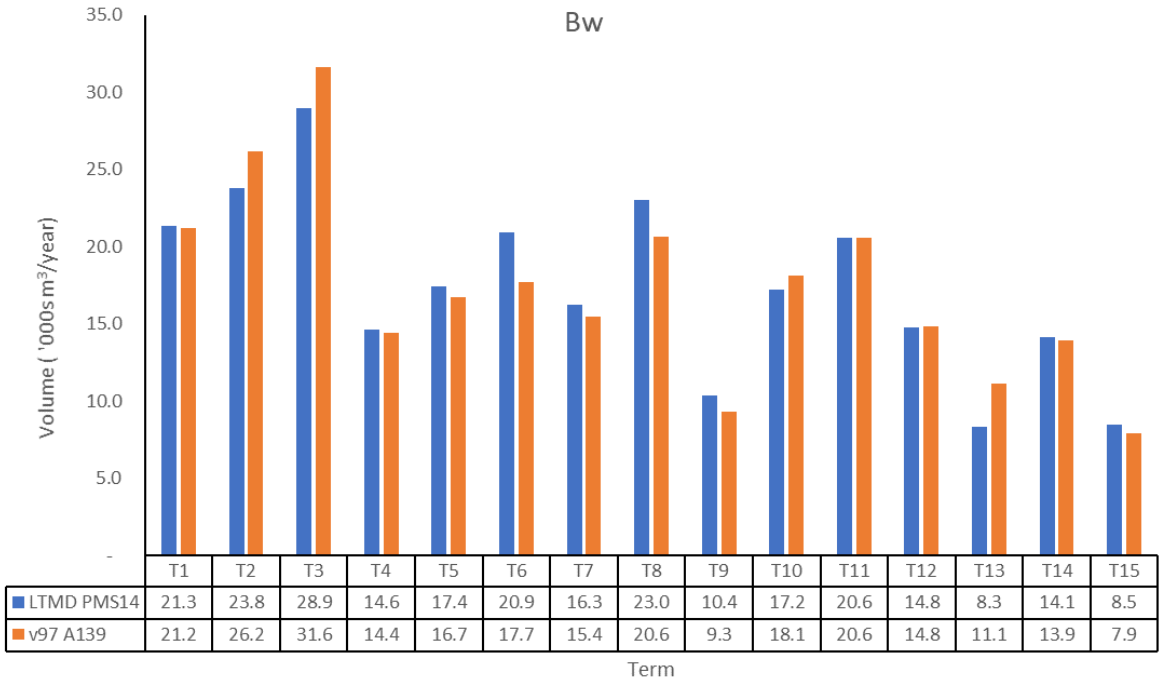
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
LTMD PMS14	251.0	240.0	216.0	200.0	240.0	240.0	233.5	210.2	189.2	227.0	240.0	216.0	232.5	220.4	240.0
v97 A139	260.8	240.0	216.0	194.4	200.9	241.0	216.9	195.2	194.4	217.9	240.0	216.0	218.4	212.6	234.9

Figure 24, Projected Spruce-Pine-Fir volumes for the LTMD and Planned operations (v97) across all terms.



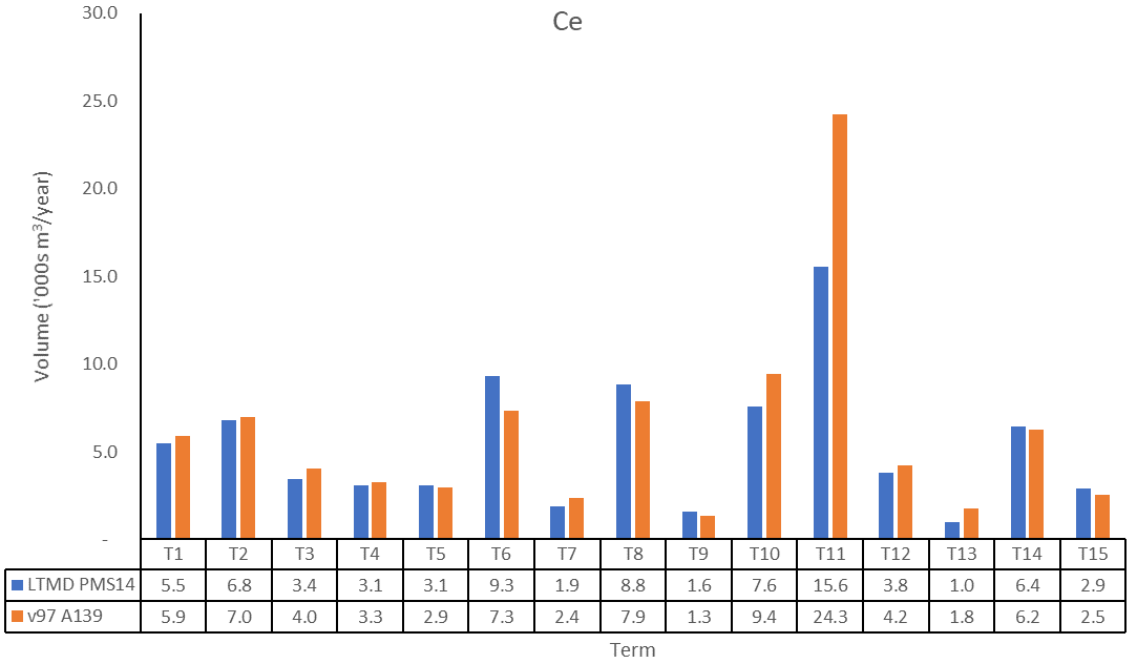
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
LTMD PMS14	145.2	130.7	117.6	105.9	95.3	85.7	134.1	120.7	108.7	97.8	88.0	79.2	71.3	64.2	59.4
v97 A139	143.5	129.2	116.3	104.6	94.2	84.8	116.7	105.1	94.6	85.1	76.6	68.9	69.4	62.5	56.2

Figure 25,Projected Poplar volumes for the LTMD and Planned operations (v97) across all terms



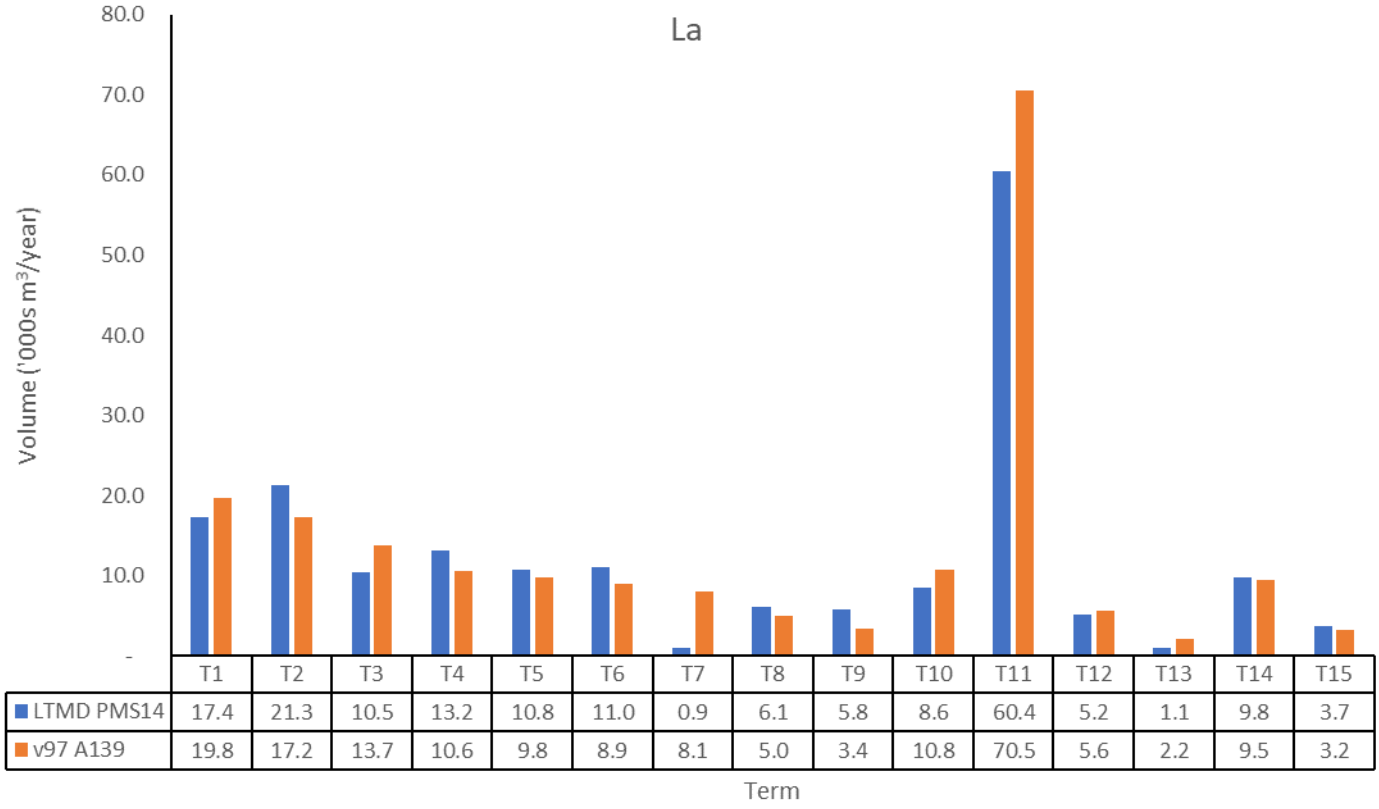
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
LTMD PMS14	21.3	23.8	28.9	14.6	17.4	20.9	16.3	23.0	10.4	17.2	20.6	14.8	8.3	14.1	8.5
v97 A139	21.2	26.2	31.6	14.4	16.7	17.7	15.4	20.6	9.3	18.1	20.6	14.8	11.1	13.9	7.9

Figure 26, Projected White birch volumes for the LTMD and Planned operations (v97) across all terms



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
LTMD PMS14	5.5	6.8	3.4	3.1	3.1	9.3	1.9	8.8	1.6	7.6	15.6	3.8	1.0	6.4	2.9
v97 A139	5.9	7.0	4.0	3.3	2.9	7.3	2.4	7.9	1.3	9.4	24.3	4.2	1.8	6.2	2.5

Figure 27, Projected Cedar volumes for the LTMD and Planned operations (v97) across all terms



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
LTMD PMS14	17.4	21.3	10.5	13.2	10.8	11.0	0.9	6.1	5.8	8.6	60.4	5.2	1.1	9.8	3.7
v97 A139	19.8	17.2	13.7	10.6	9.8	8.9	8.1	5.0	3.4	10.8	70.5	5.6	2.2	9.5	3.2

Figure 28, Projected Larch volumes for the LTMD and Planned operations (v97) across all terms

Projected SPF volume achievement (Figure 24) shows some variance between the LTMD and planned operations (i.e. A139 run) over the planning horizon. As a result, the current industrial demand (240,000m^3/year) is not met in some terms, presenting a critical challenge for maintaining a consistent wood supply from the Nagagami forest for the receiving facilities dependant on this volume. This shortfall has significant implications in the long-term for these facilities to operate and provide employment, and will likely need to be addressed through a combination of strategic forest management planning and business decisions to maintain future wood flow to the affected facilities.

Volume trends in Po, Bw, Ce, and La are relatively consistent between the LTMD and planned operations (Figure 25 to Figure 28). Currently, the only market available for Po and Bw fibre is for veneer products, thus most of the utilized volume is expected to be harvested from mixed stands, with less utilization of pure stands. Additionally, Poplar volume achievement declines over time, which will compromise the ability of the forest to meet the Current Industrial Demand for poplar veneer in future planning cycles. This projected shortfall will need to be given careful consideration during the formulation of future FMPs. Ce and La currently have no viable market, thus most of the volume harvested will likely be a by-product of harvest targeting the larger species groups (i.e. SPF), with pure stands left unutilized.

Table 27, 10-year Harvest volume projections for the LTMD and planned operations (v97; A139 and stand level volumes) across all species groups.

Species Group	Desirable level (m^3)	LTMD Available (m^3)	Planned operations A139 (v97) (m^3)	Planned Operations (v97) - stand level volumes (m^3)
SPF	2,400,000	2,509,605	2,608,016	2,532,433
Po	1,750,000	1,452,124	1,435,449	1,359,783
Bw	177,000	213,240	212,158	206,558
Ce	-	54,727	59,183	89,027
La	90,000	173,838	197,780	224,025

**Note: planned operations - stand level volumes were calculated based on attributes of each stand (i.e., age, site class, stocking and species composition) using the Empirical yield calculations in MIST (i.e. FMP-13 10-year planned harvest volume). LTMD available and Planned operations A139 are projected based on the average stand conditions defined in the SFMM model*

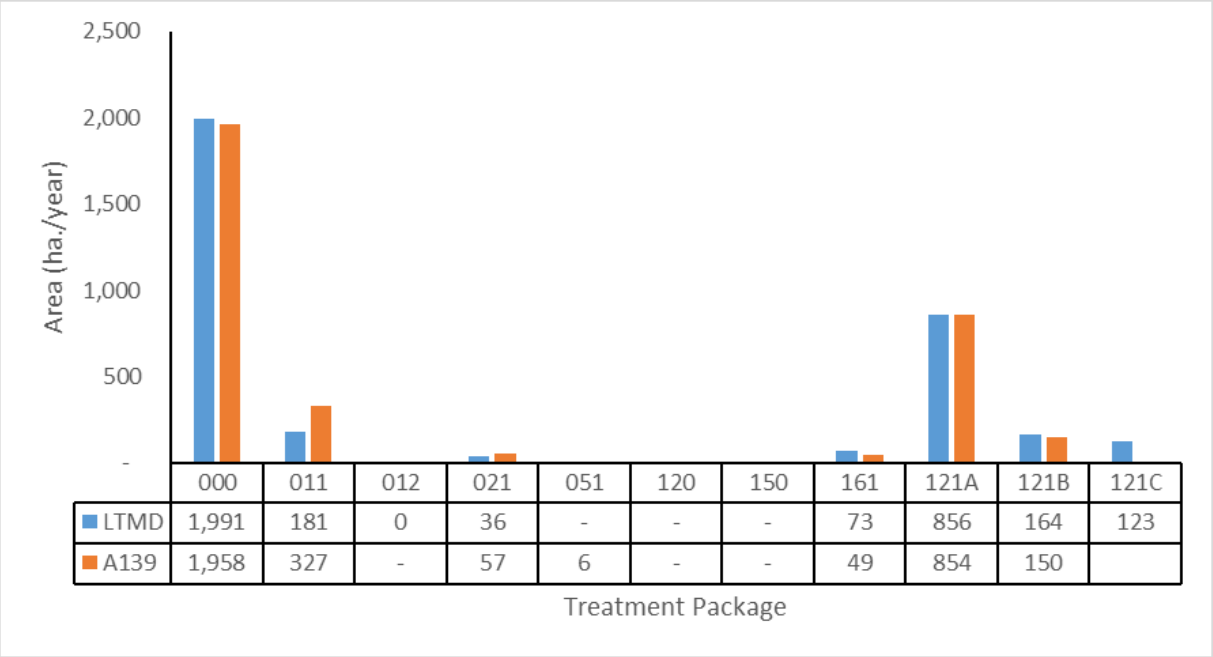
The planned volume for Po only achieves 82 % of the desired level. Additionally, the stand level volume projection shows a 6.4% decrease from what was projected in the LTMD, further decreasing achievement in T1. This shortfall in poplar volume presents challenges when attempting to meet the committed supply agreement volume of veneer products (33,000 m^3/year)

The projected use for La and Bw are both satisfied by the stand level volume projections for the 2021-31 FMP.

In general, the available harvest volumes are relatively consistent with the stand level volumes of planned operations for all species groups, except Ce shows an increase of 62% in stand level volumes relative to LTMD available. This discrepancy is not expected to impact management objective achievement as Ce lacks a viable market.

4.9.1.3 Renewal and Tending Operations

The following section provides a comparison of the projected level of renewal intensities as forecast by the LTMD with the planned levels estimated for the Planned Operations (i.e. A139).



	000	011	012	021	051	120	150	161	121A	121B	121C
LTMD	1,991	181	0	36	-	-	-	73	856	164	123
A139	1,958	327	-	57	6	-	-	49	854	150	

Figure 29, LTMD and Planned operations (v97) projection of renewal efforts for 2021-31.

The forecast and planned levels of renewal and tending activities for planned operations (i.e. A139 run) are consistent with the silviculture treatment and intensity levels projected by the LTMD. There were some notable discrepancies between the LTMD and planned operations for the following SGR treatment codes:

- ***011*** *(fill planting with aerial tending and no site preparation)*
- ***021*** *(no site preparation, full planting and aerial tending)*
- ***161*** *(planting of improved stock with mechanical site preparation and tending)*
- ***121C*** *(mechanical site preparation, full plant (Sw), and aerial tending).*

As shown in Figure 29, these trends appear to be caused by an increase in fill planting (011) of SP1 with a corresponding drop in SP1 full plant of Sw (121C). The differences in 021 are due to a drop in natural regeneration of SB1 (000) with a corresponding increase in SB1 planting (021). Finally, the discrepancy in 161 treatment is due to a decrease in elite planting of SP1 in favour of fill planting (011). Differences observed in 121C are due to this treatment not being applied to SP1 in the A139 projection. The A139 projection appears to favour 011 treatment for SP1 as opposed to 121C.

Table 28, Regeneration proportions for the LTMD and Planned operations (v97).

LTMD													
PLANFU	Total	000	011	012	021	051	120	150	161	121A	121B	Succ	121C
BW1	27	0.99	-	0.01	-	-	-	-	-	-	-	-	-
LC1	403	0.75	0.25	-	-	-	-	-	-	-	-	-	-
MW1	85	0.97	-	-	-	-	-	-	-	-	0.03	-	-
MW2	7	-	-	-	-	-	-	-	-	-	1.00	-	-
PJ1	68	0.10	-	-	-	-	-	-	0.05	0.85	-	-	-
PJ2	819	0.10	-	-	-	-	-	-	0.05	0.85	-	-	-
PO1	1,013	0.90	-	-	-	-	-	-	-	0.10	-	-	-
Pwr	-	-	-	-	-	-	-	-	-	-	-	-	-
SB1	229	0.84	-	-	0.16	-	-	-	-	-	-	-	-
SF1	192	0.50	-	-	-	-	-	-	-	-	0.50	-	-
SP1	580	0.50	0.14	-	-	-	-	-	0.05	-	0.10	-	0.21
A139													
PLANFU	Total	000	011	012	021	051	120	150	161	121A	121B	Succ	121C
BW1	26	1.00	-	-	-	-	-	-	-	-	-	-	-
LC1	400	0.75	0.25	-	-	-	-	-	-	-	-	-	-
MW1	85	0.97	-	-	-	-	-	-	-	-	0.03	-	-
MW2	7	-	-	-	-	-	-	-	-	-	1.00	-	-
PJ1	68	0.10	-	-	-	-	-	-	0.05	0.85	-	-	-
PJ2	818	0.10	-	-	-	-	-	-	0.05	0.85	-	-	-
PO1	1,013	0.90	-	-	-	-	-	-	-	0.10	-	-	-
Pwr	-	-	-	-	-	-	-	-	-	-	-	-	-
SB1	228	0.75	-	-	0.25	-	-	-	-	-	-	-	-
SF1	178	0.50	-	-	-	0.04	-	-	-	-	0.46	-	-
SP1	580	0.50	0.39	-	-	-	-	-	0.01	-	0.10	-	-

Overall, the term 1 regeneration proportion projections of the LTMD solution appear reasonably consistent with the projection of the A139 scenario.

To ensure adequate funding is available for projected renewal activities, The SFMM model had parameters to prevent annual silviculture expenditures from exceeding forecast renewal trust fund revenues. The forecast expenditures for the LTMD were $ 1,645,380.82, which is greater than the projection for the 10-year planned operations (A139 validation run silv. expenditures = $ 1,573,363.73).

To project the cost of implementing silvicultural operations more accurately, rates for each treatment were adjusted to be more inline with projected future expenditures. As shown in FMP-19, the projected annual silviculture expenditures to fully implement proposed operations is $1,750,096.94.

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
LTMD PMS14	1,645	1,170	898	929	1,093	308	1,420	577	739	373	650	196	968	202	739
Planned operations v97	1,573	951	643	1,060	737	698	1,111	593	782	243	713	286	812	198	799

Figure 30, projected silviculture expenditures for planned operations (A139 v97) and the LTMD over the 150-year planning horizon.

The silviculture budget of planned operations varies from the LTMD projection at T2, T3, T5, T6, and T7. Overall, the planned silviculture budget is more consistent over the planning horizon and are generally consistent with the trends shown in the LTMD projection. These discrepancies do not have a material impact on management objective achievement.

4.9.1.4 Stand conditions

The following section compares the Age, stocking, site class, and species composition of the areas selected for harvest to all eligible area available for forestry for the 2021-31 planning cycle.

Table 29, Average (Area-weighted) stocking, Site Class, and age for areas selected for planned operations (v97) and all areas eligible and available for forestry during the 2021-31 Planning cycle.

Eligible Forest Area

Plan Forest Unit	Age	Site Class	Stocking	BF	BW	CW	LA	PJ	PT	PB	PR	SB	SW
BW1	96.54	2.01	0.75	0.04	0.48	0.01	0.00	0.03	0.23	0.04	-	0.09	0.07
LC1	123.60	2.11	0.70	0.03	0.02	0.24	0.26	0.01	0.01	0.00	0.00	0.41	0.01
MW1	100.38	1.89	0.72	0.05	0.17	0.01	0.00	0.15	0.32	0.02	0.00	0.22	0.05
MW2	102.73	1.74	0.63	0.09	0.21	0.06	0.01	0.05	0.23	0.05	0.00	0.16	0.14
PJ1	99.79	1.63	0.79	0.00	0.03	-	0.00	0.74	0.06	0.00	-	0.17	0.00
PJ2	99.88	1.80	0.79	0.01	0.06	0.00	0.02	0.51	0.08	0.01	0.00	0.30	0.01
PO1	95.88	2.04	0.74	0.02	0.12	0.00	0.00	0.05	0.62	0.07	0.00	0.08	0.03
PWR	89.93	1.59	0.76	0.08	0.04	-	-	-	0.10	-	0.42	0.16	-
SB1	117.71	2.19	0.69	0.01	0.01	0.03	0.11	0.01	0.00	0.00	-	0.83	0.00
SF1	114.60	1.61	0.68	0.15	0.10	0.16	0.04	0.03	0.05	0.01	0.00	0.32	0.14
SP1	106.97	1.43	0.72	0.03	0.06	0.01	0.04	0.17	0.06	0.01	-	0.61	0.01

Planned Harvest Area (PHA)

Plan Forest Unit	Age	Site Class	Stocking	BF	BW	CW	LA	PJ	PT	PB	PR	SB	SW
BW1	94.13	1.90	0.81	0.01	0.51	-	0.00	0.05	0.24	0.03	-	0.12	0.04
LC1	118.03	1.87	0.72	0.03	0.02	0.17	0.33	0.02	0.01	0.01	-	0.42	0.01
MW1	98.34	1.88	0.76	0.04	0.15	0.01	0.00	0.24	0.31	0.02	-	0.21	0.02
MW2	98.98	1.80	0.71	0.36	0.26	0.02	-	-	0.16	-	-	0.14	0.07
PJ1	99.62	1.53	0.79	0.00	0.03	-	0.00	0.74	0.06	-	-	0.17	-
PJ2	99.05	1.78	0.79	0.01	0.06	0.00	0.02	0.51	0.08	0.01	0.00	0.30	0.00
PO1	94.59	2.03	0.74	0.01	0.12	0.00	0.00	0.06	0.63	0.07	-	0.08	0.03
PWR	-	-	-	-	-	-	-	-	-	-	-	-	-
SB1	115.08	2.32	0.71	0.01	0.01	0.02	0.09	0.02	0.00	0.00	-	0.84	0.00
SF1	113.34	1.71	0.70	0.21	0.07	0.13	0.06	0.04	0.05	0.01	0.00	0.35	0.07
SP1	106.60	1.56	0.73	0.03	0.05	0.01	0.04	0.18	0.06	0.02	-	0.61	0.01

Difference (Eligible Forest Area less Planned Harvest Area)

Plan Forest Unit	Age	Site Class	Stocking	BF	BW	CW	LA	PJ	PT	PB	PR	SB	SW
BW1	2.41	0.11	- 0.06	0.03	- 0.03	0.01	- 0.00	- 0.02	- 0.00	0.01	-	- 0.03	0.03
LC1	5.57	0.24	- 0.01	0.00	0.00	0.07	- 0.07	- 0.01	0.00	- 0.00	0.00	- 0.01	0.00
MW1	2.04	0.01	- 0.04	0.01	0.02	0.01	0.00	- 0.09	0.01	- 0.00	0.00	0.02	0.03
MW2	3.76	- 0.05	- 0.08	- 0.27	- 0.05	0.04	0.01	0.05	0.08	0.05	0.00	0.02	0.08
PJ1	0.17	0.10	- 0.00	0.00	- 0.01	-	- 0.00	- 0.00	0.00	0.00	-	0.00	0.00
PJ2	0.84	0.02	- 0.00	0.00	- 0.00	0.00	- 0.00	0.00	0.00	- 0.00	- 0.00	- 0.00	0.00
PO1	1.29	0.01	- 0.00	0.01	0.00	0.00	- 0.00	- 0.01	- 0.00	0.00	0.00	- 0.00	0.01
PWR	-	-	-	-	-	-	-	-	-	-	-	-	-
SB1	2.63	- 0.13	- 0.02	- 0.00	- 0.00	0.01	0.02	- 0.01	0.00	0.00	-	- 0.01	0.00
SF1	1.26	- 0.10	- 0.02	- 0.06	0.02	0.03	- 0.02	- 0.01	0.00	0.00	- 0.00	- 0.03	0.06
SP1	0.37	- 0.12	- 0.01	- 0.00	0.01	0.00	- 0.00	- 0.01	0.01	- 0.01	-	0.00	0.01

Age

In general, the age of areas selected for operations are consistent with the average condition of the eligible area. the largest discrepancy is occurring in LC1 where the area allocated is 5.57 years younger than the eligible area. This can be explained by the operability of the allocated areas as a considerable amount of area eligible for harvest occurs within historic riparian reserves and bypass. Efforts were

made to allocate these areas where possible, however younger areas were substituted for older areas to make harvest blocks operationally feasible.

Site class

Discrepancies in site class are not significant, are generally consistent with the average condition of the eligible harvest areas and reflect the spatial location of the 10-yr allocation as opposed to average modeled conditions for the entire forest.

Stocking

Discrepancies in stocking level are not significant, are generally consistent with the average condition of the eligible harvest areas, and reflect the spatial location of the 10-yr allocation as opposed to average modeled conditions for the entire forest.

Species composition

The largest discrepancy in species composition occurs in Bf in MW2, which is likely a function of the small available harvest area for the MW2 forest unit (72 ha). All other species compositions appear generally consistent with the average condition for the eligible area.

4.9.1.5 Age Class distribution

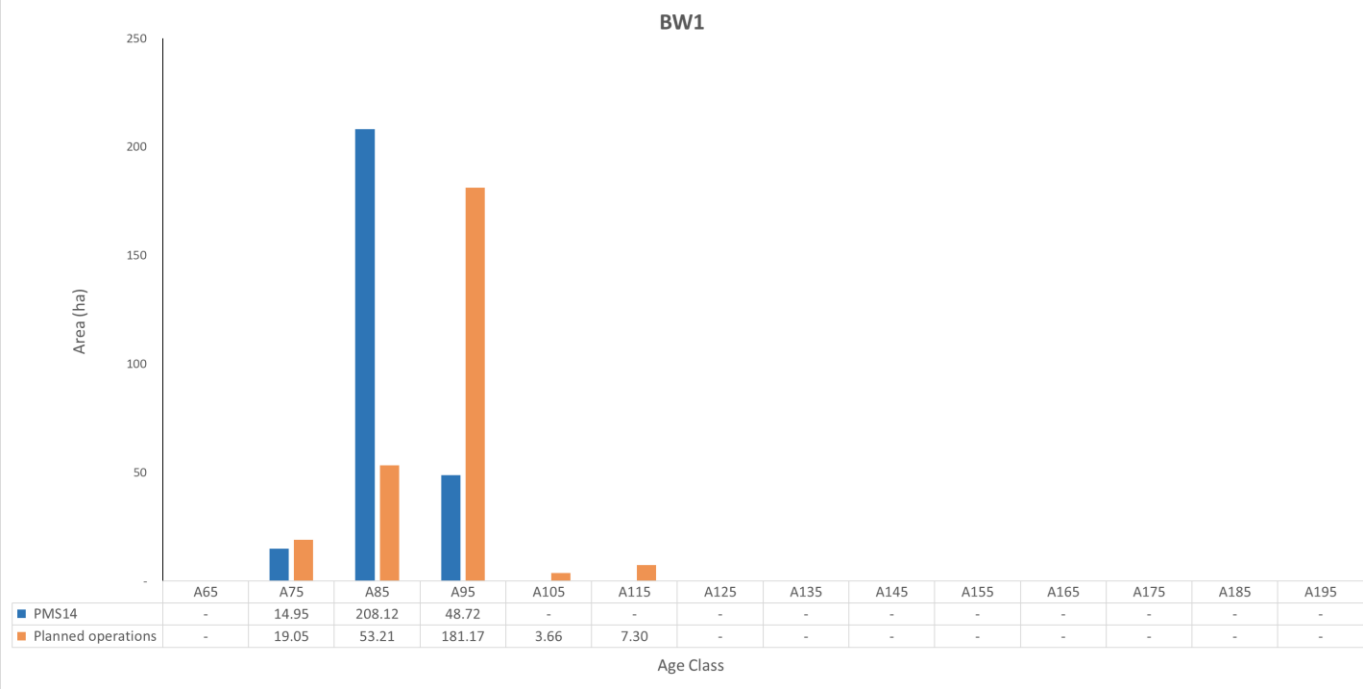
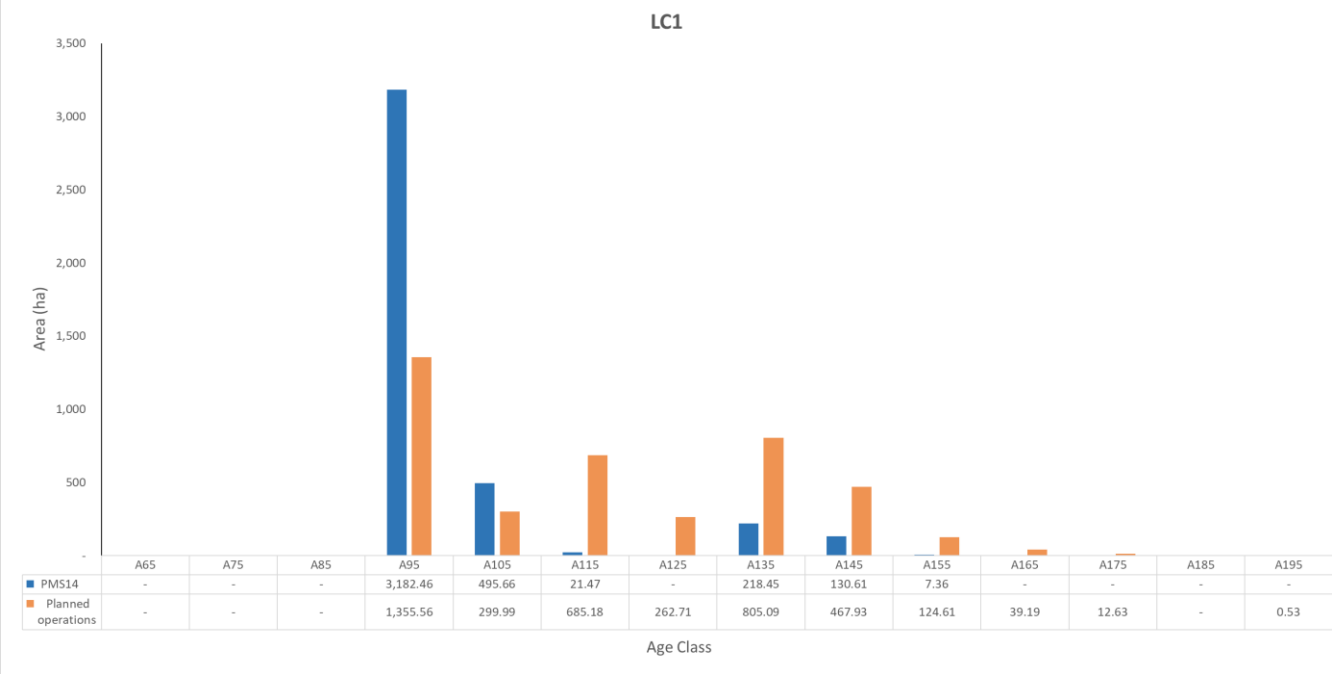
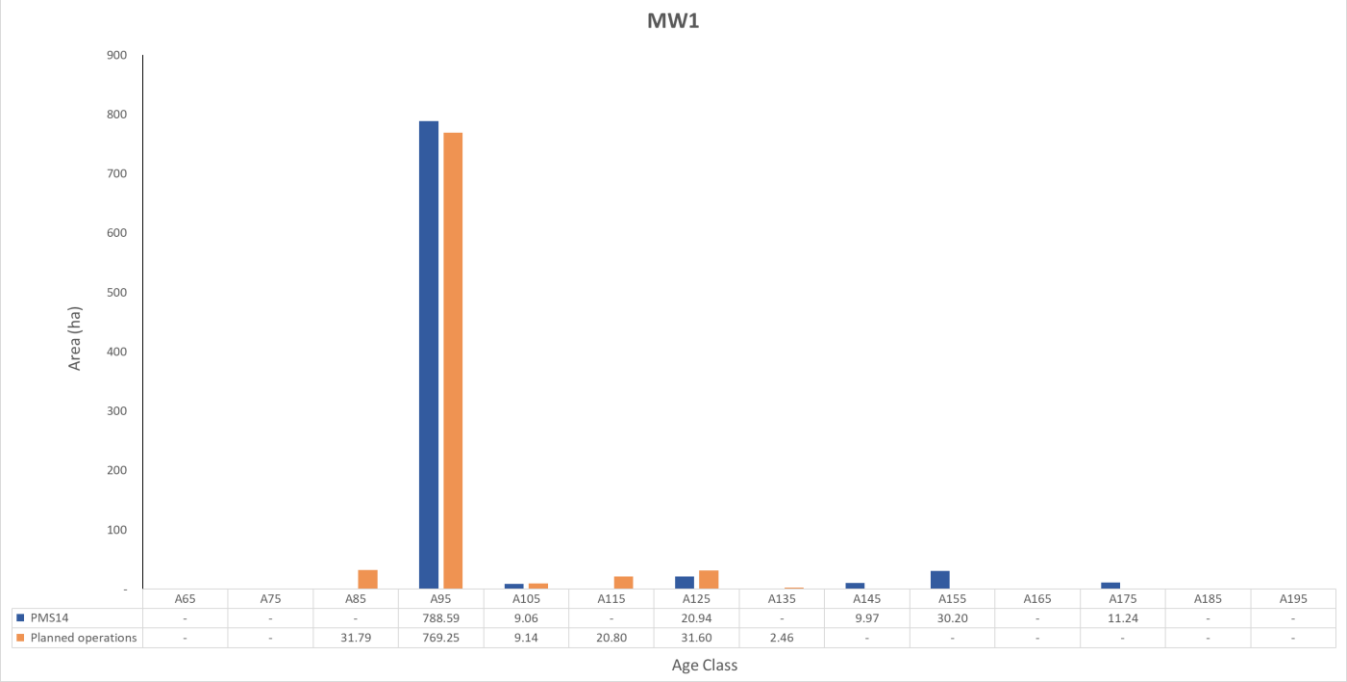


Figure 31, BW1 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area



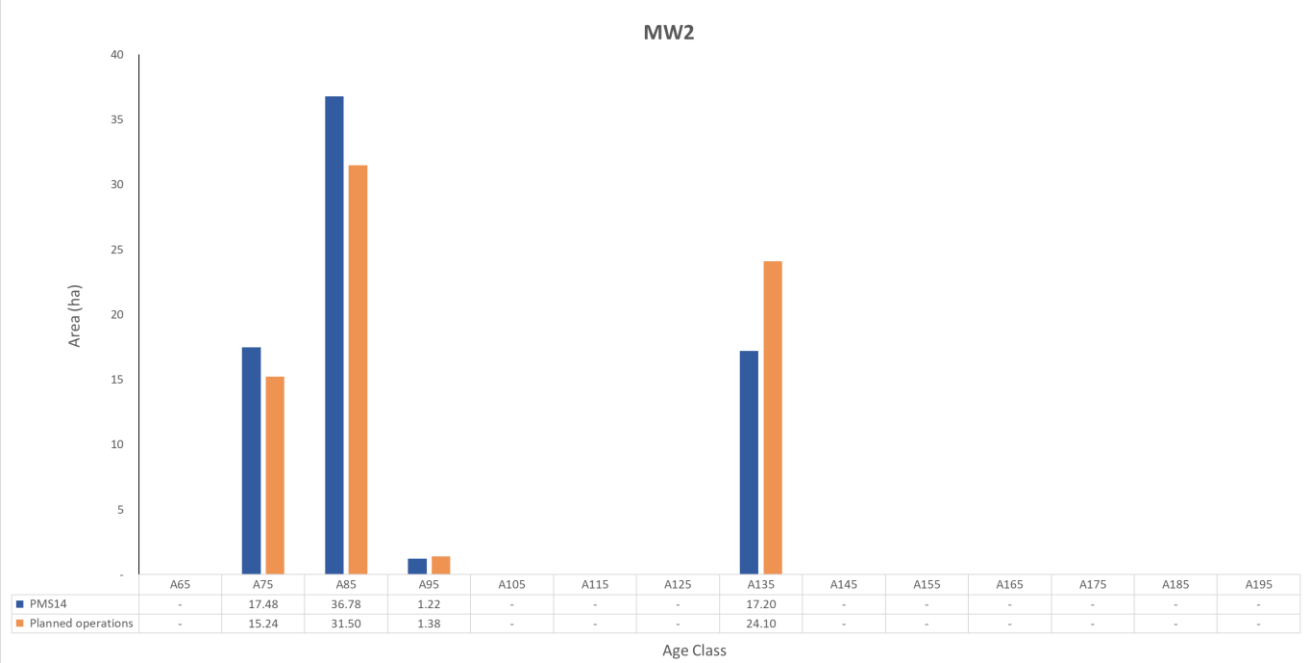
	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	-	-	3,182.46	495.66	21.47	-	218.45	130.61	7.36	-	-	-	-
Planned operations	-	-	-	1,355.56	299.99	685.18	262.71	805.09	467.93	124.61	39.19	12.63	-	0.53

Figure 32, LC1 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area.



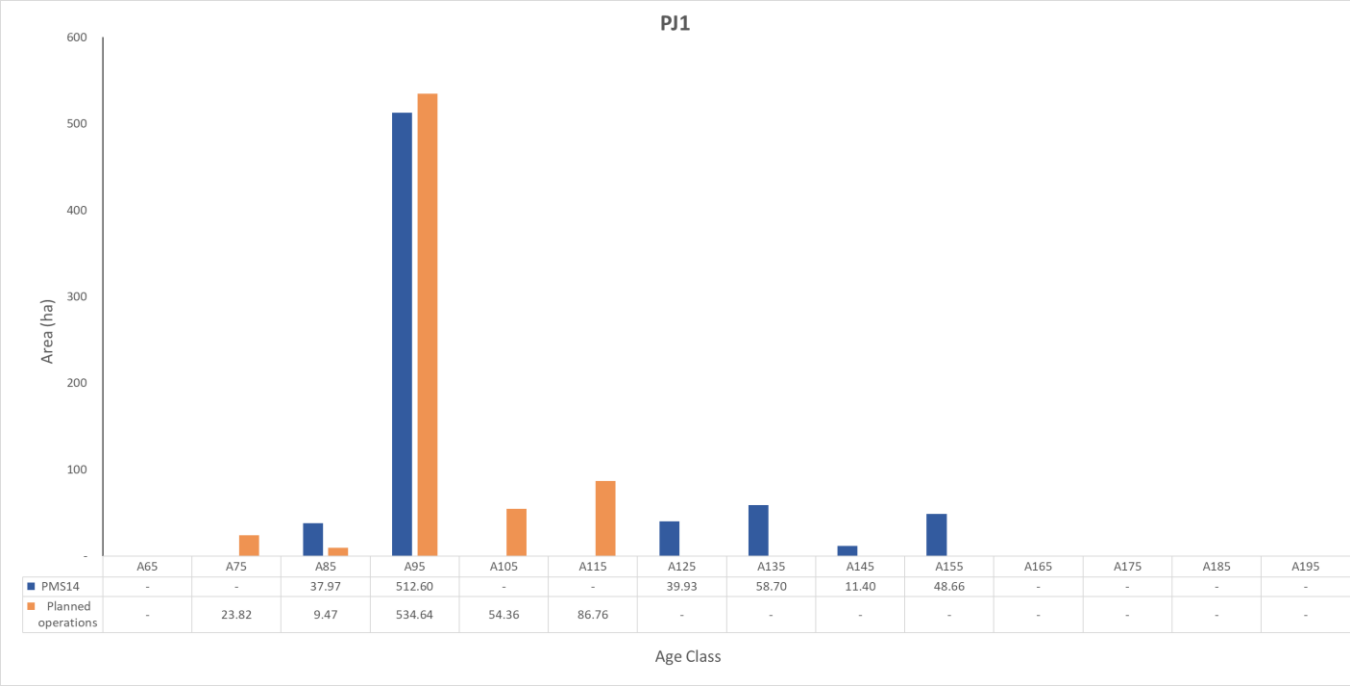
	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	-	-	788.59	9.06	-	20.94	-	9.97	30.20	-	11.24	-	-
Planned operations	-	-	31.79	769.25	9.14	20.80	31.60	2.46	-	-	-	-	-	-

Figure 33, MW1 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area.



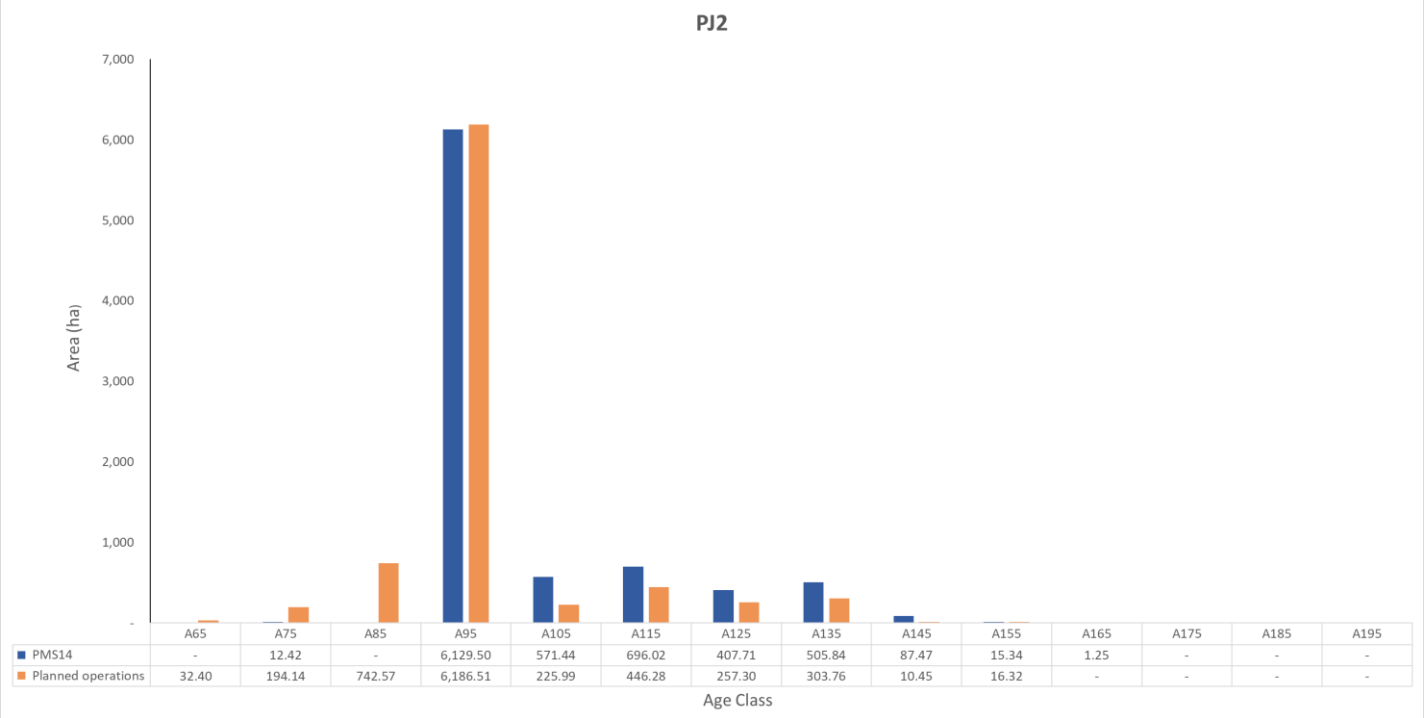
	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	17.48	36.78	1.22	-	-	-	17.20	-	-	-	-	-	-
Planned operations	-	15.24	31.50	1.38	-	-	-	24.10	-	-	-	-	-	-

Figure 34, MW2 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area.



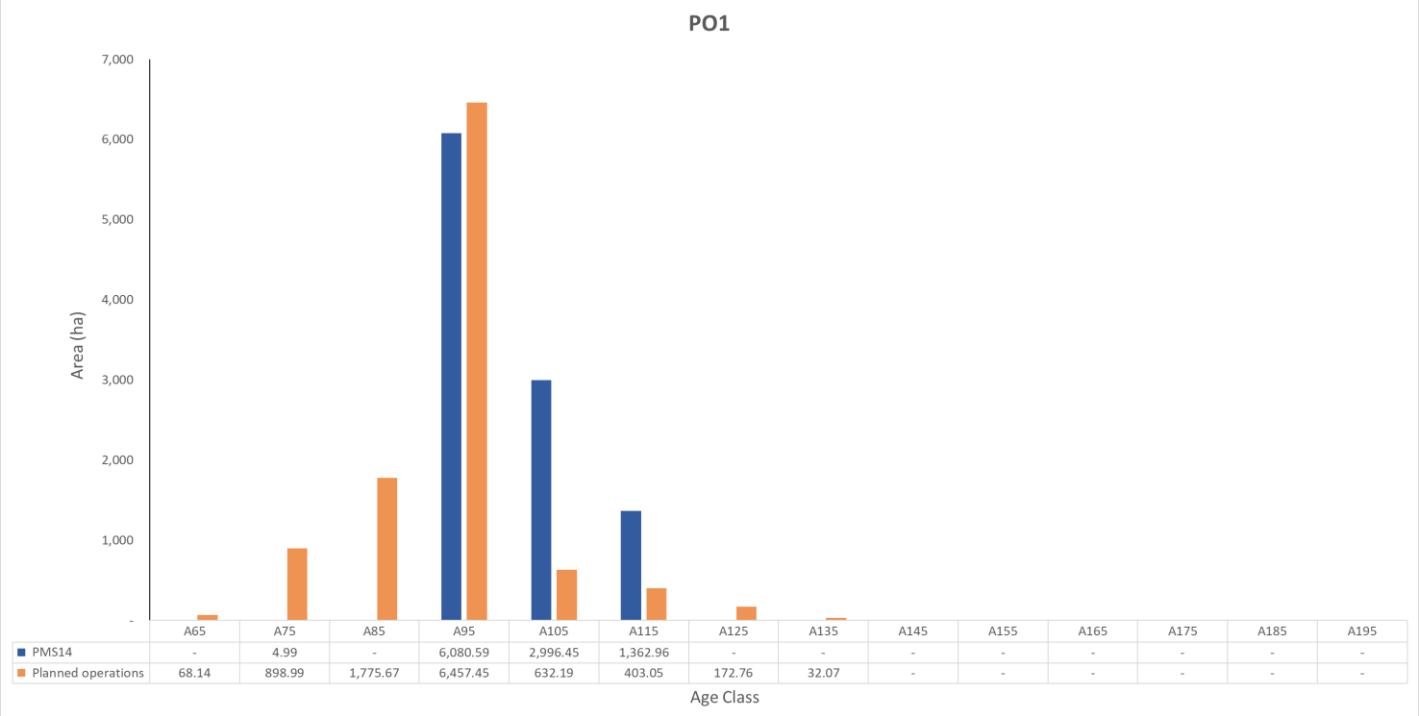
	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	-	37.97	512.60	-	-	39.93	58.70	11.40	48.66	-	-	-	-
Planned operations	-	23.82	9.47	534.64	54.36	86.76	-	-	-	-	-	-	-	-

Figure 35, PJ1 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area.



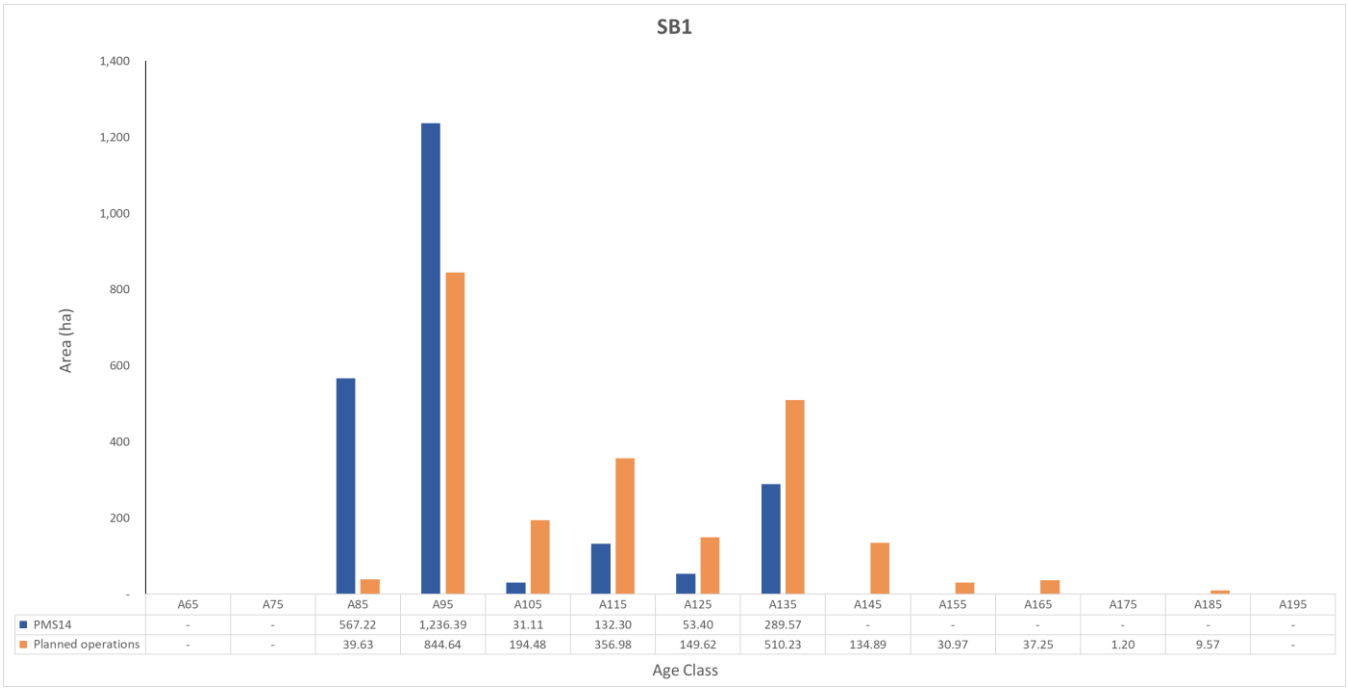
	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	12.42	-	6,129.50	571.44	696.02	407.71	505.84	87.47	15.34	1.25	-	-	-
Planned operations	32.40	194.14	742.57	6,186.51	225.99	446.28	257.30	303.76	10.45	16.32	-	-	-	-

Figure 36, PJ2 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area.



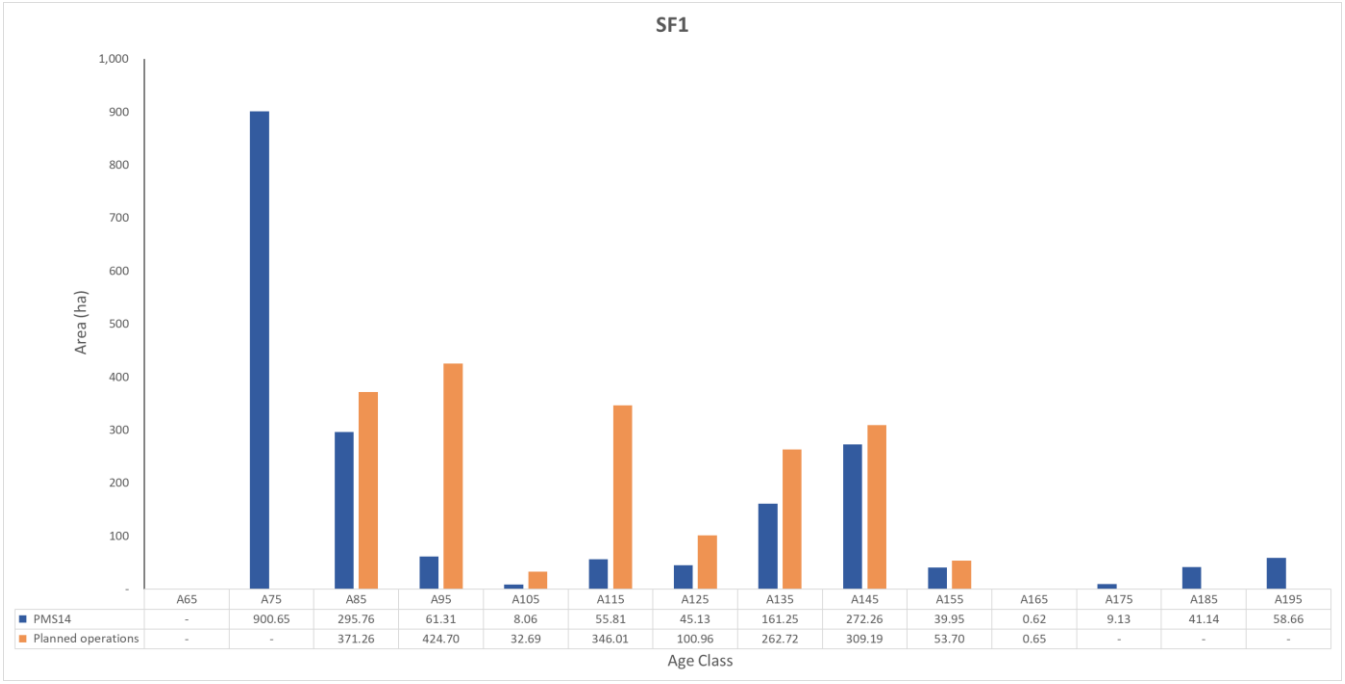
	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	4.99	-	6,080.59	2,996.45	1,362.96	-	-	-	-	-	-	-	-
Planned operations	68.14	898.99	1,775.67	6,457.45	632.19	403.05	172.76	32.07	-	-	-	-	-	-

Figure 37, PO1 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area.



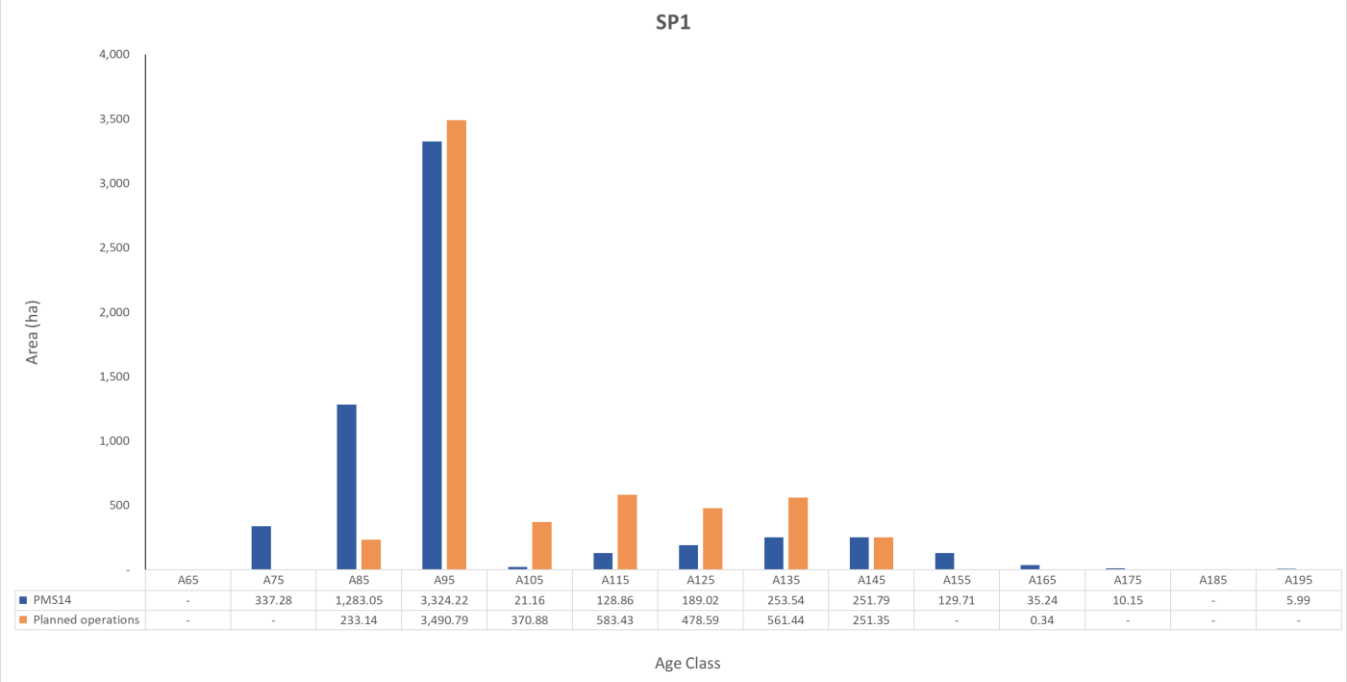
	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	-	567.22	1,236.39	31.11	132.30	53.40	289.57	-	-	-	-	-	-
Planned operations	-	-	39.63	844.64	194.48	356.98	149.62	510.23	134.89	30.97	37.25	1.20	9.57	-

Figure 38, SB1 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area



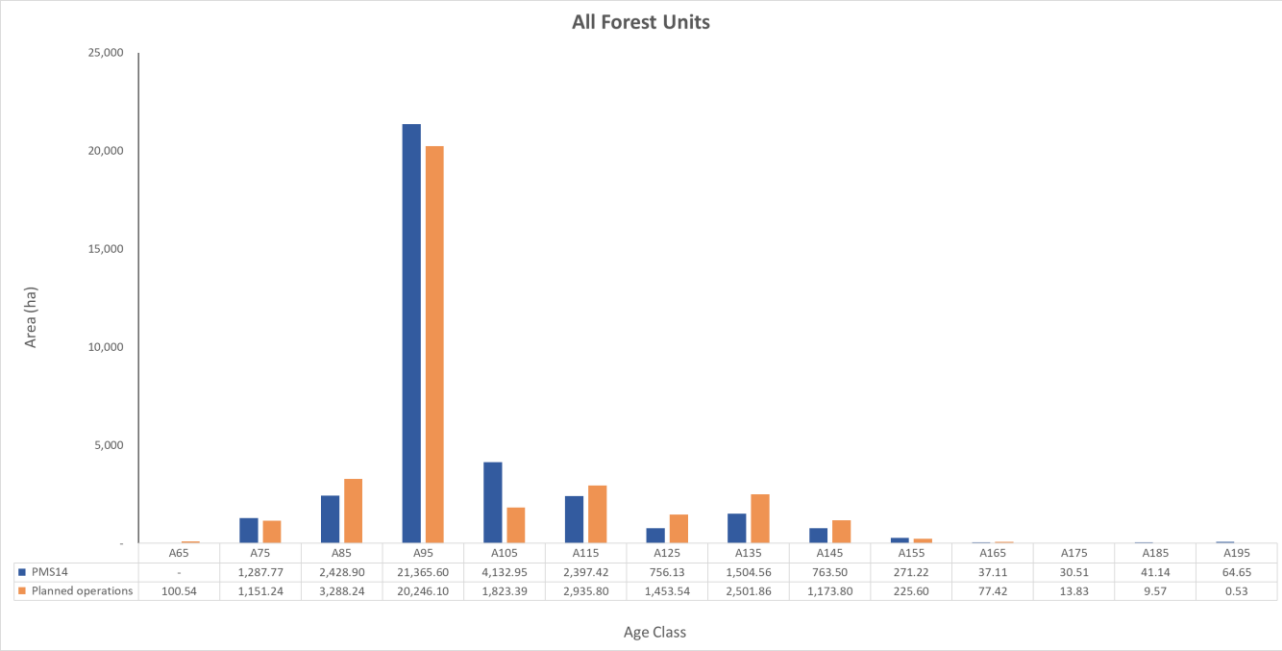
	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	900.65	295.76	61.31	8.06	55.81	45.13	161.25	272.26	39.95	0.62	9.13	41.14	58.66
Planned operations	-	-	371.26	424.70	32.69	346.01	100.96	262.72	309.19	53.70	0.65	-	-	-

Figure 39, SF1 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area



	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	337.28	1,283.05	3,324.22	21.16	128.86	189.02	253.54	251.79	129.71	35.24	10.15	-	5.99
Planned operations	-	-	233.14	3,490.79	370.88	583.43	478.59	561.44	251.35	-	0.34	-	-	-

Figure 40, SP1 Age class distribution for planned operations (v97) and the LTMD Available Harvest Area



	A65	A75	A85	A95	A105	A115	A125	A135	A145	A155	A165	A175	A185	A195
PMS14	-	1,287.77	2,428.90	21,365.60	4,132.95	2,397.42	756.13	1,504.56	763.50	271.22	37.11	30.51	41.14	64.65
Planned operations	100.54	1,151.24	3,288.24	20,246.10	1,823.39	2,935.80	1,453.54	2,501.86	1,173.80	225.60	77.42	13.83	9.57	0.53

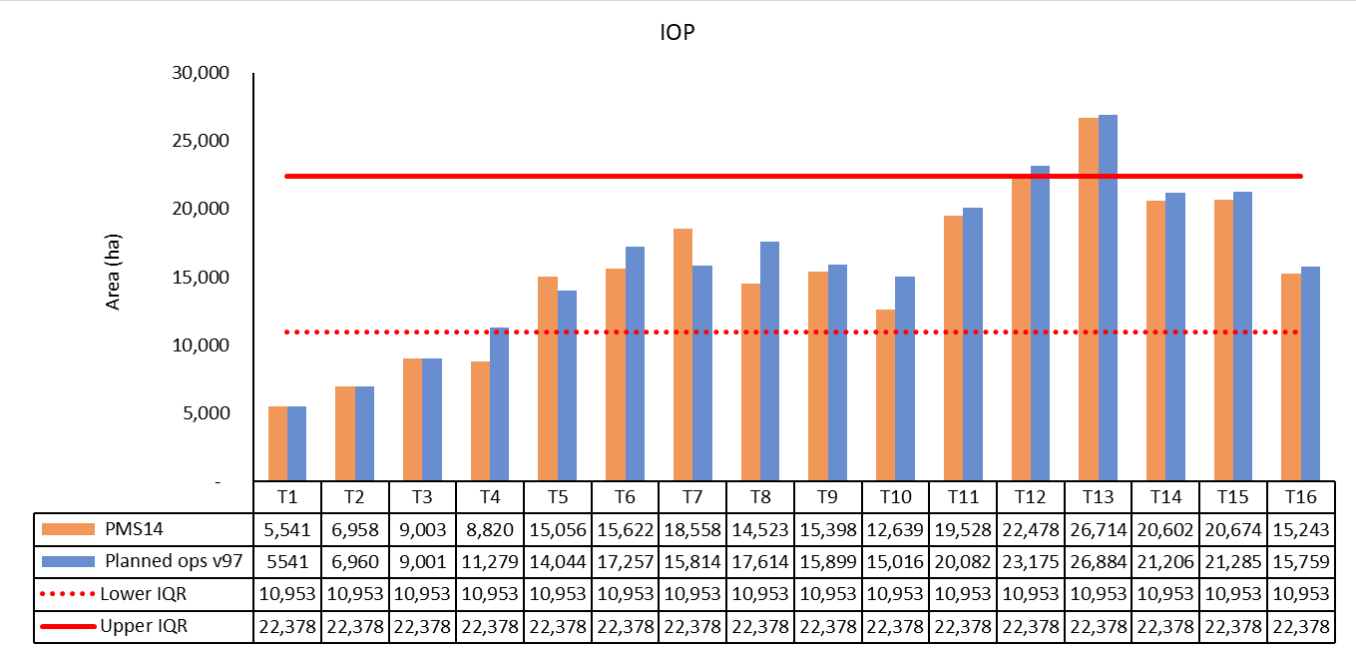
Figure 41, Age class distribution for planned operations (v97) an the LTMD Available Harvest Area.

Overall, the age class distribution among all forest units is relatively consistent and reflect the spatial and access constraints described in the eligibility criteria. Some younger age classes were substituted for older age classes in PO1 and PJ2. The age class substitution of PJ2 may have contributed to a decrease in SPF volume achievement in later terms. The arrangement of eligible PJ2 area on the landbase necessitated age class substitution as the configuration and orientation of remaining PJ2 stands are not conducive to viable harvest blocks. Conversely older age classes were substituted for

younger ones in SP1, SF1, SB1, LC1 and BW1. In general, except for PJ2 (for the reasons described above) the level of age class substitutions does not impact objective achievements.

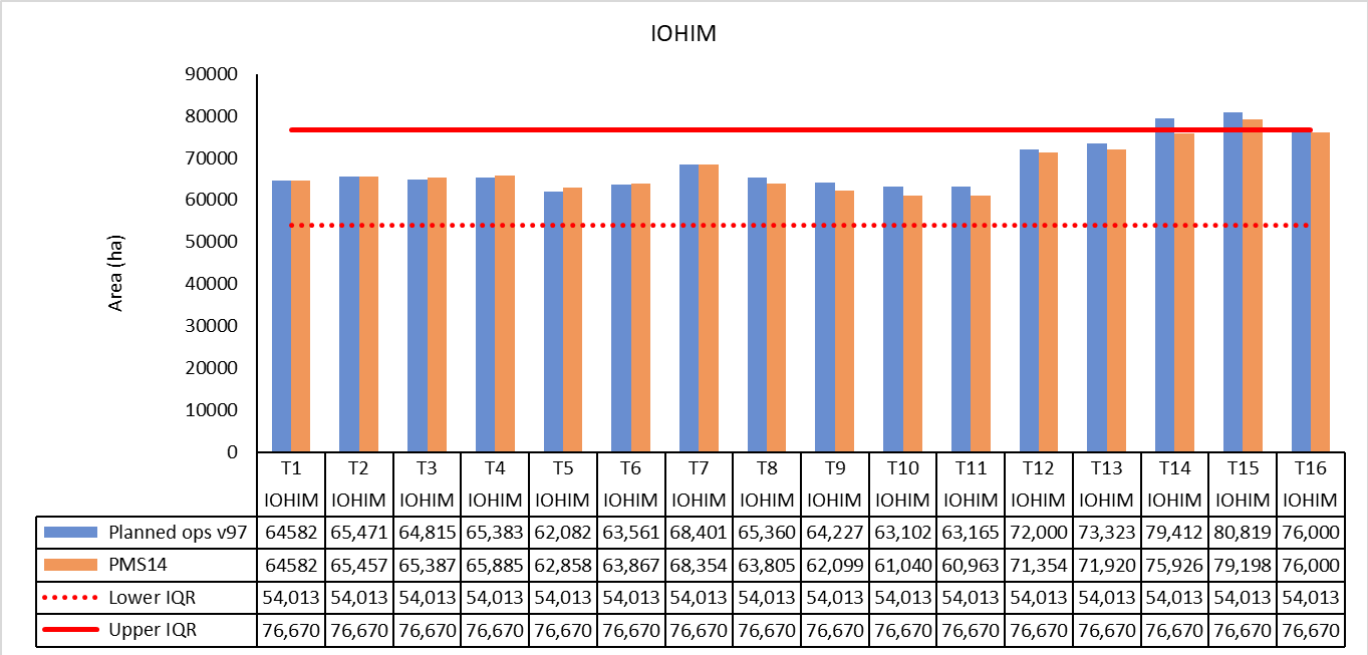
4.9.1.6 Boreal Landscape guide indicators

The following section compares performance of the LTMD and planned operations for each boreal landscape guide indicator.



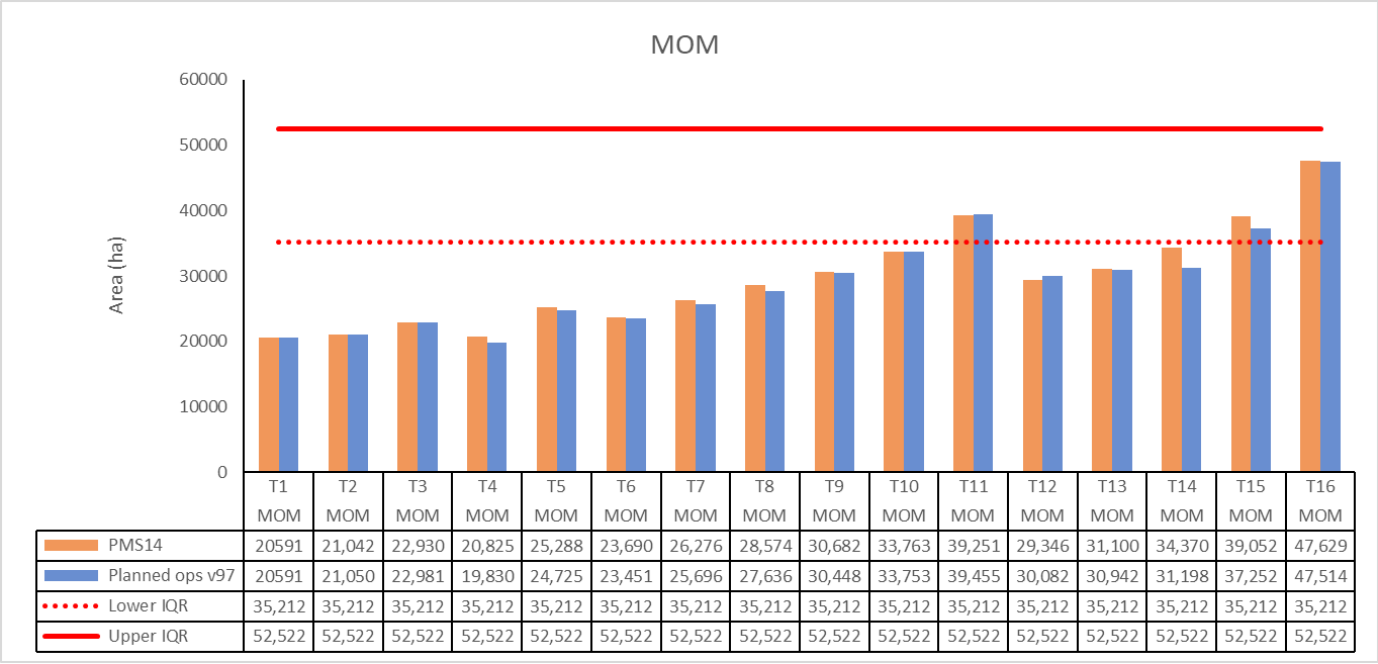
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
PMS14	5,541	6,958	9,003	8,820	15,056	15,622	18,558	14,523	15,398	12,639	19,528	22,478	26,714	20,602	20,674	15,243
Planned ops v97	5541	6,960	9,001	11,279	14,044	17,257	15,814	17,614	15,899	15,016	20,082	23,175	26,884	21,206	21,285	15,759
Lower IQR	10,953	10,953	10,953	10,953	10,953	10,953	10,953	10,953	10,953	10,953	10,953	10,953	10,953	10,953	10,953	10,953
Upper IQR	22,378	22,378	22,378	22,378	22,378	22,378	22,378	22,378	22,378	22,378	22,378	22,378	22,378	22,378	22,378	22,378

Figure 42, Immature and older Pine landscape class indicator performance for the LTMD and planned operations. The IQR represents the inter quartile range of the SRNV.



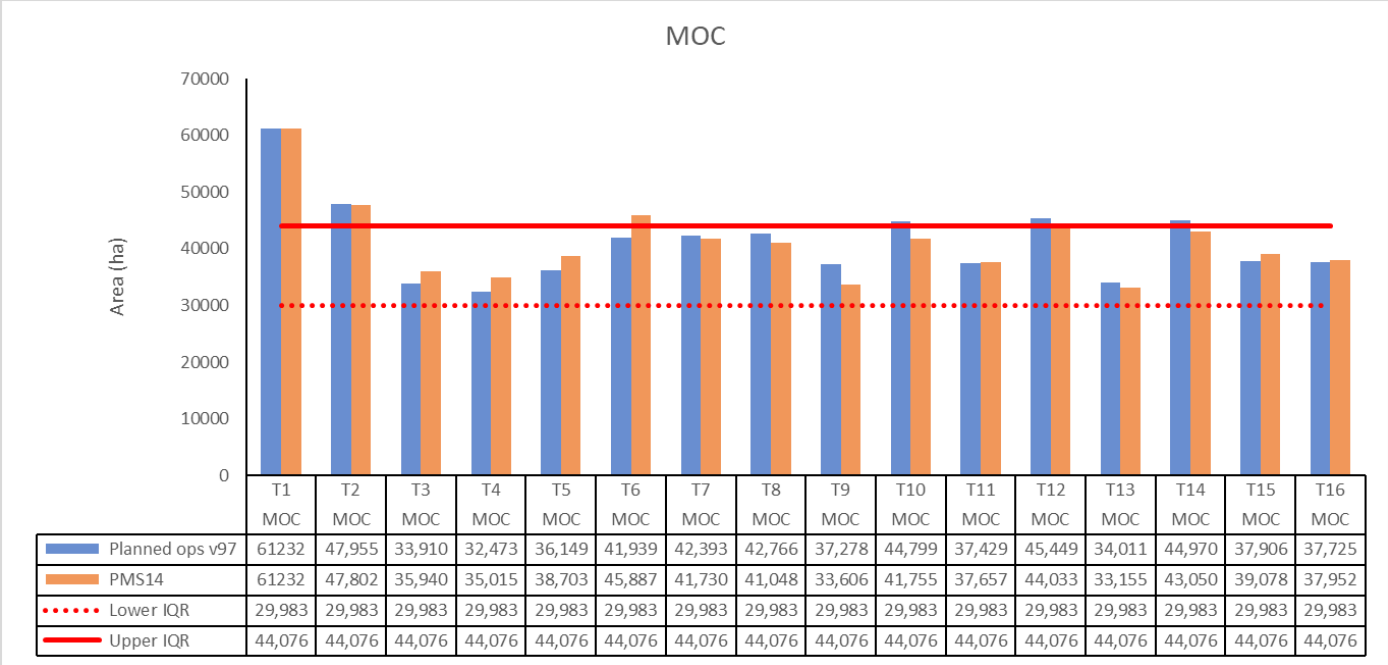
	T1 IOHIM	T2 IOHIM	T3 IOHIM	T4 IOHIM	T5 IOHIM	T6 IOHIM	T7 IOHIM	T8 IOHIM	T9 IOHIM	T10 IOHIM	T11 IOHIM	T12 IOHIM	T13 IOHIM	T14 IOHIM	T15 IOHIM	T16 IOHIM
Planned ops v97	64582	65,471	64,815	65,383	62,082	63,561	68,401	65,360	64,227	63,102	63,165	72,000	73,323	79,412	80,819	76,000
PMS14	64582	65,457	65,387	65,885	62,858	63,867	68,354	63,805	62,099	61,040	60,963	71,354	71,920	75,926	79,198	76,000
Lower IQR	54,013	54,013	54,013	54,013	54,013	54,013	54,013	54,013	54,013	54,013	54,013	54,013	54,013	54,013	54,013	54,013
Upper IQR	76,670	76,670	76,670	76,670	76,670	76,670	76,670	76,670	76,670	76,670	76,670	76,670	76,670	76,670	76,670	76,670

Figure 43, Immature and older Hardwood and Immature mixed wood landscape class indicator performance for the LTMD and planned operations. IQR represents the inter quartile range of the SRNV.



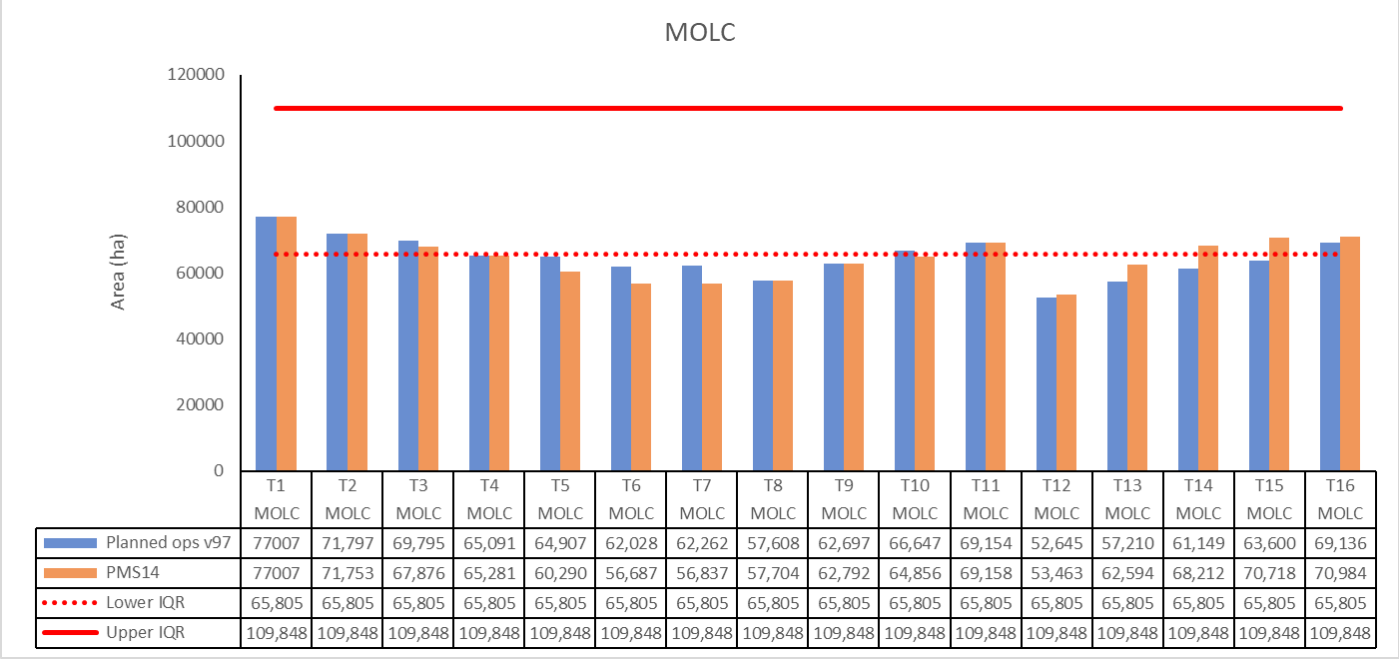
	T1 MOM	T2 MOM	T3 MOM	T4 MOM	T5 MOM	T6 MOM	T7 MOM	T8 MOM	T9 MOM	T10 MOM	T11 MOM	T12 MOM	T13 MOM	T14 MOM	T15 MOM	T16 MOM
PMS14	20591	21,042	22,930	20,825	25,288	23,690	26,276	28,574	30,682	33,763	39,251	29,346	31,100	34,370	39,052	47,629
Planned ops v97	20591	21,050	22,981	19,830	24,725	23,451	25,696	27,636	30,448	33,753	39,455	30,082	30,942	31,198	37,252	47,514
Lower IQR	35,212	35,212	35,212	35,212	35,212	35,212	35,212	35,212	35,212	35,212	35,212	35,212	35,212	35,212	35,212	35,212
Upper IQR	52,522	52,522	52,522	52,522	52,522	52,522	52,522	52,522	52,522	52,522	52,522	52,522	52,522	52,522	52,522	52,522

Figure 44, Mature and older mixed wood landscape class indicator performance for the LTMD and planned operations. IQR represents the inter quartile range of the SRNV.



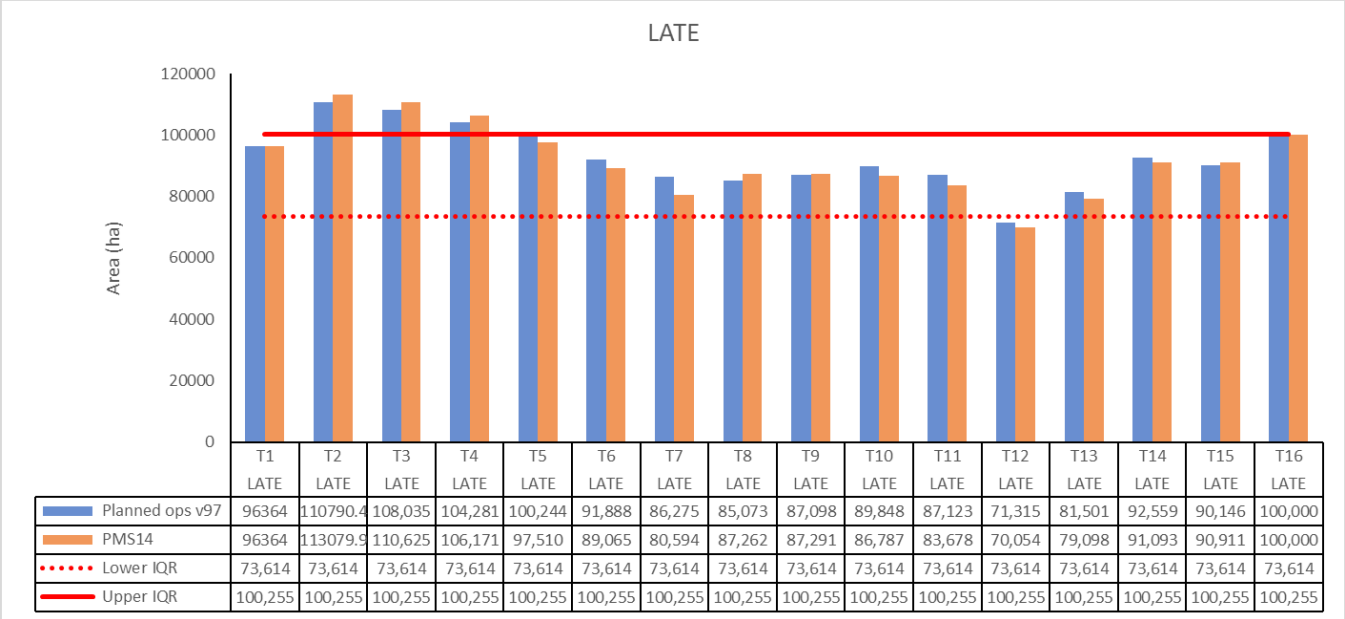
	T1 MOC	T2 MOC	T3 MOC	T4 MOC	T5 MOC	T6 MOC	T7 MOC	T8 MOC	T9 MOC	T10 MOC	T11 MOC	T12 MOC	T13 MOC	T14 MOC	T15 MOC	T16 MOC
Planned ops v97	61232	47,955	33,910	32,473	36,149	41,939	42,393	42,766	37,278	44,799	37,429	45,449	34,011	44,970	37,906	37,725
PMS14	61232	47,802	35,940	35,015	38,703	45,887	41,730	41,048	33,606	41,755	37,657	44,033	33,155	43,050	39,078	37,952
Lower IQR	29,983	29,983	29,983	29,983	29,983	29,983	29,983	29,983	29,983	29,983	29,983	29,983	29,983	29,983	29,983	29,983
Upper IQR	44,076	44,076	44,076	44,076	44,076	44,076	44,076	44,076	44,076	44,076	44,076	44,076	44,076	44,076	44,076	44,076

Figure 45, Mature and Older Conifer landscape class indicator performance for the LTMD and planned operations. IQR represents the inter quartile range of the SRNV.



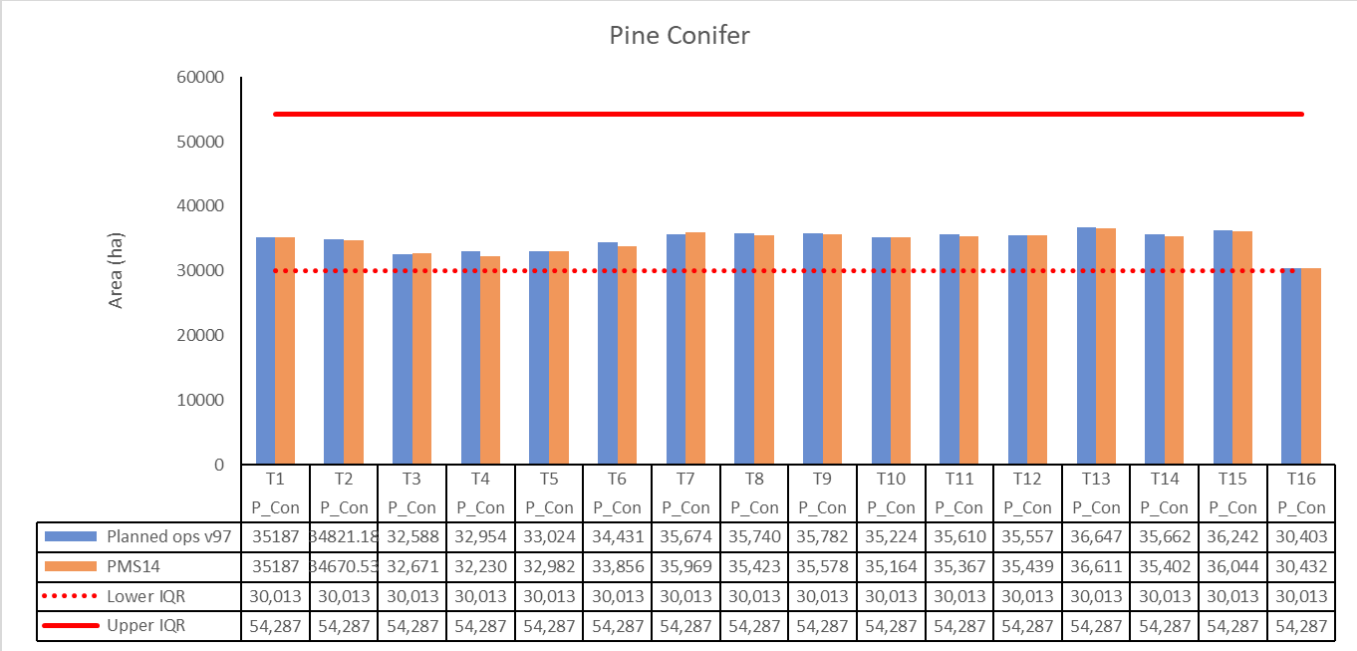
	T1 MOLC	T2 MOLC	T3 MOLC	T4 MOLC	T5 MOLC	T6 MOLC	T7 MOLC	T8 MOLC	T9 MOLC	T10 MOLC	T11 MOLC	T12 MOLC	T13 MOLC	T14 MOLC	T15 MOLC	T16 MOLC
Planned ops v97	77007	71,797	69,795	65,091	64,907	62,028	62,262	57,608	62,697	66,647	69,154	52,645	57,210	61,149	63,600	69,136
PMS14	77007	71,753	67,876	65,281	60,290	56,687	56,837	57,704	62,792	64,856	69,158	53,463	62,594	68,212	70,718	70,984
Lower IQR	65,805	65,805	65,805	65,805	65,805	65,805	65,805	65,805	65,805	65,805	65,805	65,805	65,805	65,805	65,805	65,805
Upper IQR	109,848	109,848	109,848	109,848	109,848	109,848	109,848	109,848	109,848	109,848	109,848	109,848	109,848	109,848	109,848	109,848

Figure 46, Mature and Older Lowland Conifer landscape class indicator performance for the LTMD and planned operations. IQR represents the inter quartile range of the SRNV.



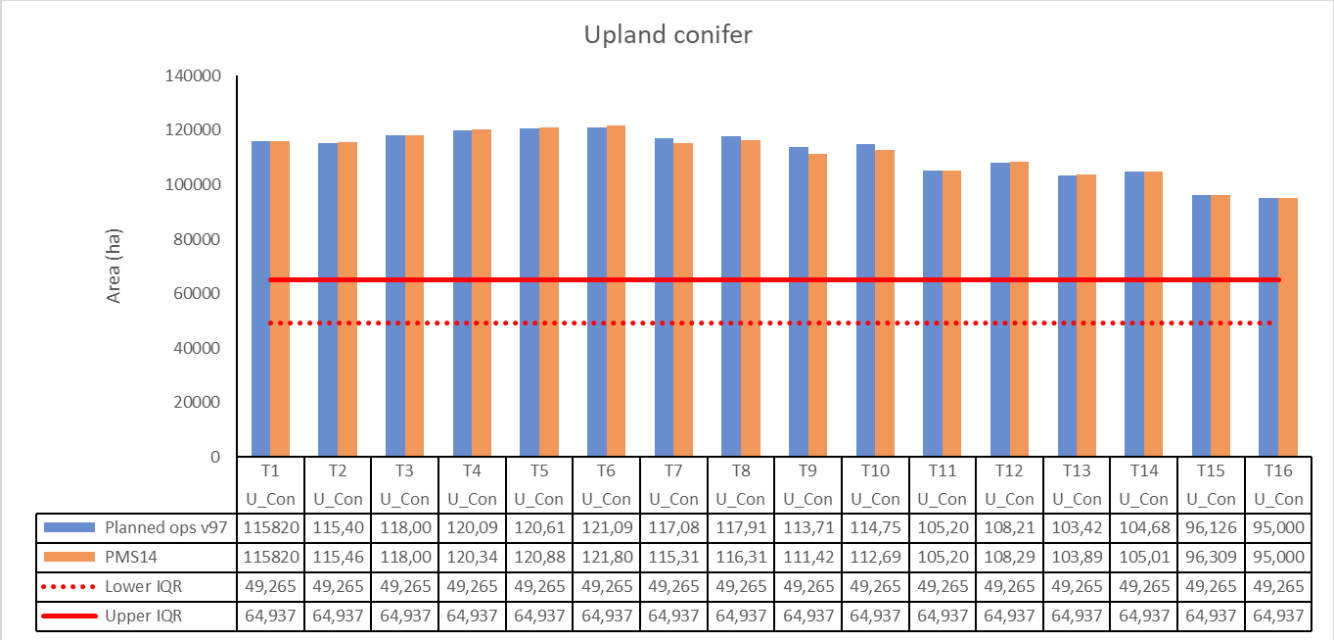
	T1 LATE	T2 LATE	T3 LATE	T4 LATE	T5 LATE	T6 LATE	T7 LATE	T8 LATE	T9 LATE	T10 LATE	T11 LATE	T12 LATE	T13 LATE	T14 LATE	T15 LATE	T16 LATE
Planned ops v97	96364	110790.4	108,035	104,281	100,244	91,888	86,275	85,073	87,098	89,848	87,123	71,315	81,501	92,559	90,146	100,000
PMS14	96364	113079.9	110,625	106,171	97,510	89,065	80,594	87,262	87,291	86,787	83,678	70,054	79,098	91,093	90,911	100,000
Lower IQR	73,614	73,614	73,614	73,614	73,614	73,614	73,614	73,614	73,614	73,614	73,614	73,614	73,614	73,614	73,614	73,614
Upper IQR	100,255	100,255	100,255	100,255	100,255	100,255	100,255	100,255	100,255	100,255	100,255	100,255	100,255	100,255	100,255	100,255

Figure 47, Late/Successional (old growth) landscape class indicator performance for the LTMD and planned operations. IQR represents the inter quartile range of the SRNV.



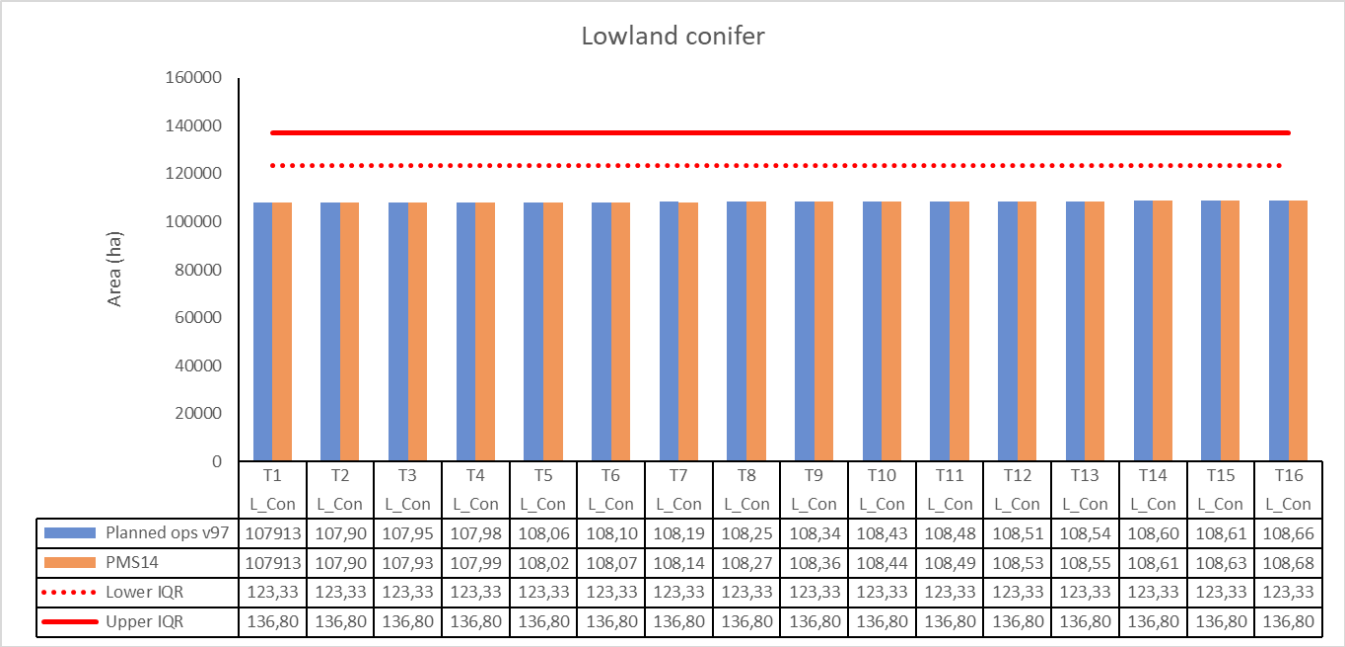
	T1 P_Con	T2 P_Con	T3 P_Con	T4 P_Con	T5 P_Con	T6 P_Con	T7 P_Con	T8 P_Con	T9 P_Con	T10 P_Con	T11 P_Con	T12 P_Con	T13 P_Con	T14 P_Con	T15 P_Con	T16 P_Con
Planned ops v97	35187	34821.18	32,588	32,954	33,024	34,431	35,674	35,740	35,782	35,224	35,610	35,557	36,647	35,662	36,242	30,403
PMS14	35187	34670.53	32,671	32,230	32,982	33,856	35,969	35,423	35,578	35,164	35,367	35,439	36,611	35,402	36,044	30,432
Lower IQR	30,013	30,013	30,013	30,013	30,013	30,013	30,013	30,013	30,013	30,013	30,013	30,013	30,013	30,013	30,013	30,013
Upper IQR	54,287	54,287	54,287	54,287	54,287	54,287	54,287	54,287	54,287	54,287	54,287	54,287	54,287	54,287	54,287	54,287

Figure 48, Pine conifer species group performance for the LTMD and planned operations. IQR represents the inter quartile range of the SRNV.



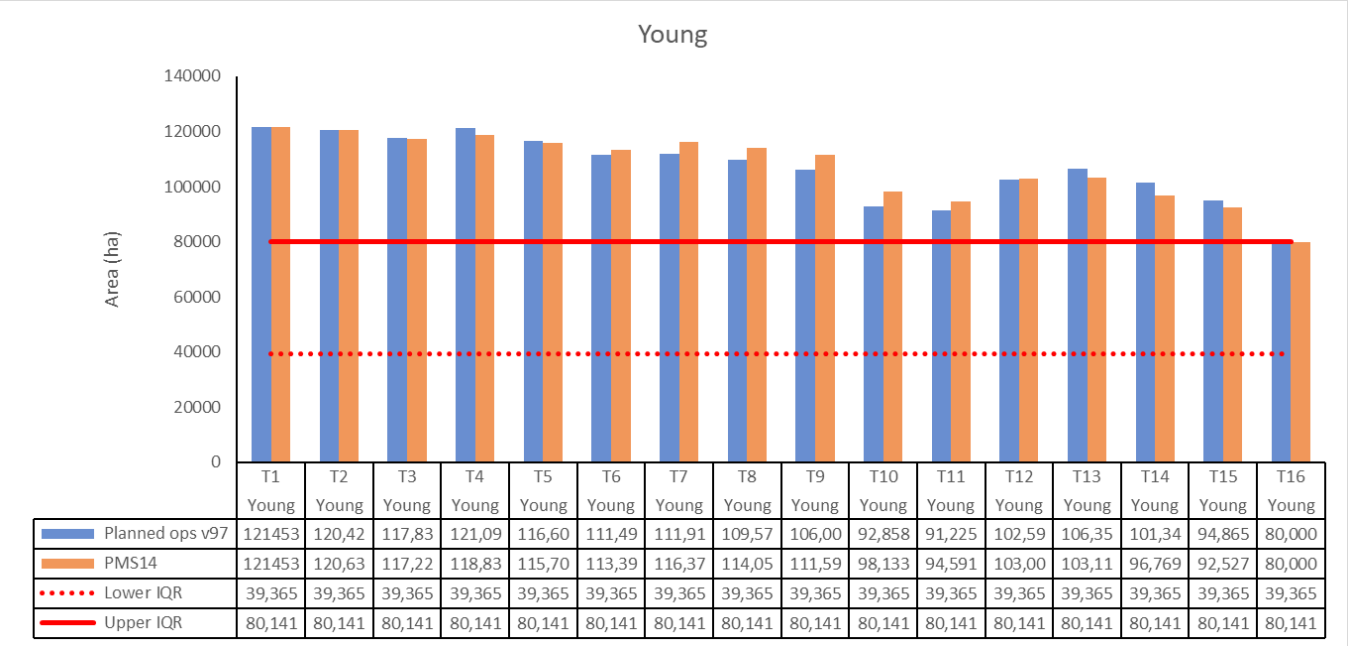
	T1 U_Con	T2 U_Con	T3 U_Con	T4 U_Con	T5 U_Con	T6 U_Con	T7 U_Con	T8 U_Con	T9 U_Con	T10 U_Con	T11 U_Con	T12 U_Con	T13 U_Con	T14 U_Con	T15 U_Con	T16 U_Con
Planned ops v97	115820	115,40	118,00	120,09	120,61	121,09	117,08	117,91	113,71	114,75	105,20	108,21	103,42	104,68	96,126	95,000
PMS14	115820	115,46	118,00	120,34	120,88	121,80	115,31	116,31	111,42	112,69	105,20	108,29	103,89	105,01	96,309	95,000
Lower IQR	49,265	49,265	49,265	49,265	49,265	49,265	49,265	49,265	49,265	49,265	49,265	49,265	49,265	49,265	49,265	49,265
Upper IQR	64,937	64,937	64,937	64,937	64,937	64,937	64,937	64,937	64,937	64,937	64,937	64,937	64,937	64,937	64,937	64,937

Figure 49, Upland conifer species group performance for the LTMD and planned operations. IQR represents the inter quartile range of the SRNV.



	T1 L_Con	T2 L_Con	T3 L_Con	T4 L_Con	T5 L_Con	T6 L_Con	T7 L_Con	T8 L_Con	T9 L_Con	T10 L_Con	T11 L_Con	T12 L_Con	T13 L_Con	T14 L_Con	T15 L_Con	T16 L_Con
Planned ops v97	107913	107,90	107,95	107,98	108,06	108,10	108,19	108,25	108,34	108,43	108,48	108,51	108,54	108,60	108,61	108,66
PMS14	107913	107,90	107,93	107,99	108,02	108,07	108,14	108,27	108,36	108,44	108,49	108,53	108,55	108,61	108,63	108,68
Lower IQR	123,33	123,33	123,33	123,33	123,33	123,33	123,33	123,33	123,33	123,33	123,33	123,33	123,33	123,33	123,33	123,33
Upper IQR	136,80	136,80	136,80	136,80	136,80	136,80	136,80	136,80	136,80	136,80	136,80	136,80	136,80	136,80	136,80	136,80

Figure 50, Lowland conifer species group performance for the LTMD and planned operations. IQR represents the inter quartile range of the SRNV.



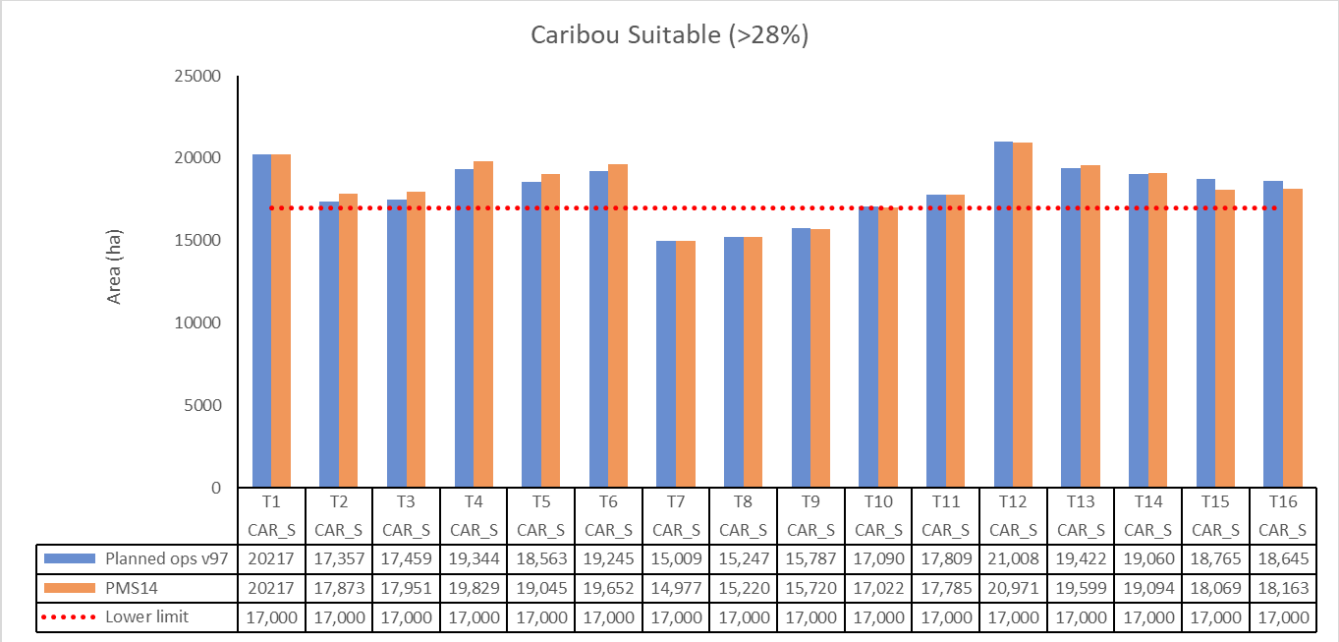
	T1 Young	T2 Young	T3 Young	T4 Young	T5 Young	T6 Young	T7 Young	T8 Young	T9 Young	T10 Young	T11 Young	T12 Young	T13 Young	T14 Young	T15 Young	T16 Young
Planned ops v97	121453	120,42	117,83	121,09	116,60	111,49	111,91	109,57	106,00	92,858	91,225	102,59	106,35	101,34	94,865	80,000
PMS14	121453	120,63	117,22	118,83	115,70	113,39	116,37	114,05	111,59	98,133	94,591	103,00	103,11	96,769	92,527	80,000
Lower IQR	39,365	39,365	39,365	39,365	39,365	39,365	39,365	39,365	39,365	39,365	39,365	39,365	39,365	39,365	39,365	39,365
Upper IQR	80,141	80,141	80,141	80,141	80,141	80,141	80,141	80,141	80,141	80,141	80,141	80,141	80,141	80,141	80,141	80,141

Figure 51, Young forest landscape class indicator performance for the LTMD and planned operations. IQR represents the inter quartile range of the SRNV.

In general, landscape class indicator performance was similar between the LTMD and planned operations. Some minor discrepancies occur in Immature and Older Pine, Mature and Older Conifer, Mature and Older Lowland conifer, old growth (LATE), and Young forest indicators however the planned operations all follow the IQR achievement trends shown in the LTMD. As such, planned operations do not cause any significant changes in management objective achievement in any of the Boreal landscape guide indicators.

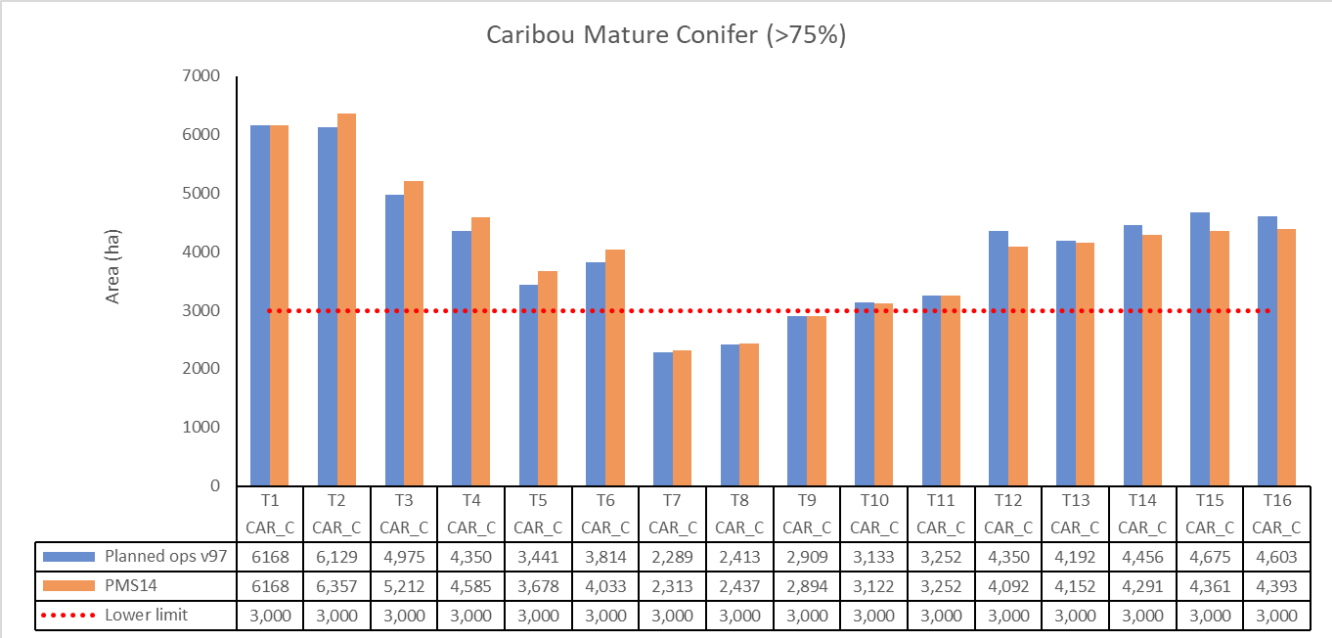
4.9.1.7 Caribou habitat

Caribou habitat was also tracked during the development of the LTMD for the portion of the forest that overlaps the continuous caribou range. The following section compares caribou habitat within the continuous range between LTMD and planned operations.



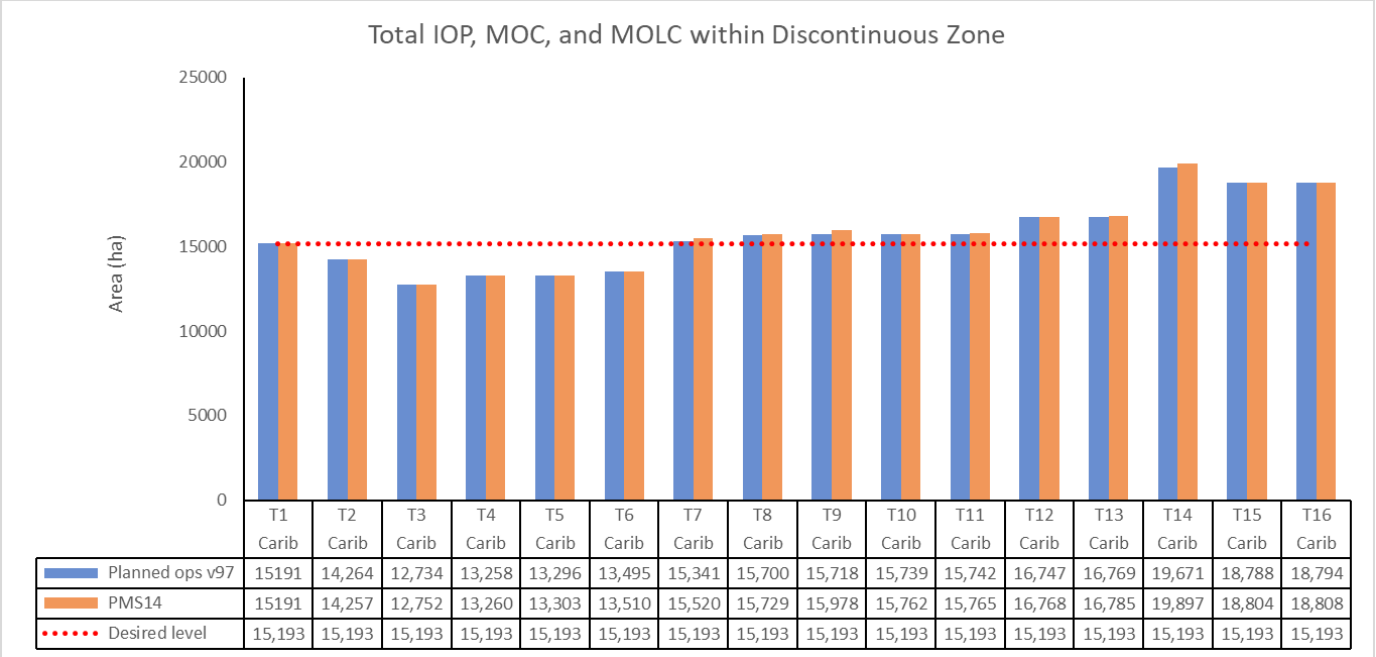
	T1 CAR_S	T2 CAR_S	T3 CAR_S	T4 CAR_S	T5 CAR_S	T6 CAR_S	T7 CAR_S	T8 CAR_S	T9 CAR_S	T10 CAR_S	T11 CAR_S	T12 CAR_S	T13 CAR_S	T14 CAR_S	T15 CAR_S	T16 CAR_S
Planned ops v97	20217	17,357	17,459	19,344	18,563	19,245	15,009	15,247	15,787	17,090	17,809	21,008	19,422	19,060	18,765	18,645
PMS14	20217	17,873	17,951	19,829	19,045	19,652	14,977	15,220	15,720	17,022	17,785	20,971	19,599	19,094	18,069	18,163
Lower limit	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000	17,000

Figure 52, Caribou winter suitable habitat (>28% mature conifer) for LTMD and planned operations within the continuous zone.



	T1 CAR_C	T2 CAR_C	T3 CAR_C	T4 CAR_C	T5 CAR_C	T6 CAR_C	T7 CAR_C	T8 CAR_C	T9 CAR_C	T10 CAR_C	T11 CAR_C	T12 CAR_C	T13 CAR_C	T14 CAR_C	T15 CAR_C	T16 CAR_C
Planned ops v97	6168	6,129	4,975	4,350	3,441	3,814	2,289	2,413	2,909	3,133	3,252	4,350	4,192	4,456	4,675	4,603
PMS14	6168	6,357	5,212	4,585	3,678	4,033	2,313	2,437	2,894	3,122	3,252	4,092	4,152	4,291	4,361	4,393
Lower limit	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000

Figure 53, Caribou mature conifer (>75% mature conifer) for LTMD and planned operations within the continuous zone.



	T1 Carib	T2 Carib	T3 Carib	T4 Carib	T5 Carib	T6 Carib	T7 Carib	T8 Carib	T9 Carib	T10 Carib	T11 Carib	T12 Carib	T13 Carib	T14 Carib	T15 Carib	T16 Carib
Planned ops v97	15191	14,264	12,734	13,258	13,296	13,495	15,341	15,700	15,718	15,739	15,742	16,747	16,769	19,671	18,788	18,794
PMS14	15191	14,257	12,752	13,260	13,303	13,510	15,520	15,729	15,978	15,762	15,765	16,768	16,785	19,897	18,804	18,808
Desired level	15,193	15,193	15,193	15,193	15,193	15,193	15,193	15,193	15,193	15,193	15,193	15,193	15,193	15,193	15,193	15,193

Figure 54, Total pooled area of IOP, MOC, and MOLC within the discontinuous zone

Within the continuous zone, caribou habitat levels perform similarly between the LTMD and planned operations. Both caribou habitat indicators remain above the lower IQR threshold for 60 years. The decrease in caribou habitat observed during T7-T9 was examined and accepted by the planning team during the development of the LTMD, when it was decided that adhering to the spatial requirements of the dynamic caribou habitat schedule was a higher priority. Overall, the discrepancies between LTMD and planned operations do not compromise the achievement of either caribou habitat management objectives.

Within the discontinuous zone, caribou habitat is maintained above the desired level for most of the planning horizon. Proposed harvest within this zone causes the decrease observed between T2 and T6, which was deemed acceptable by the planning team.

5.0 DETERMINATION OF SUSTAINABILITY

5.1 Assessment of Objective Achievement

The determination of sustainability is based on the collective assessment of objective achievement, the spatial assessments, the social and economic assessment, the risk assessment, prescriptions, and conditions for the protection of values and conditions on regular operations for the protection of important ecological features. The following is a summary of the elements assessed for the determination of sustainability with regards to plant and animal life, water, soil and air quality, and social and economic values including recreational values and heritage values.

The assessment of objective achievement is based on balancing multiple, often conflicting, objectives. The management objectives and their associated indicators of sustainability address the following CFSA categories:

- *Forest diversity – natural landscape pattern and distribution; forest structure, composition, and abundance;*
- *Forest diversity and provision of forest cover – habitat for animal life;*
- *Social and economic – community well-being; healthy forest ecosystems; long-term harvest levels;*
- *Ecological sustainability – healthy forest ecosystems; and,*
- *Silviculture.*

Details on the assessment of objective achievement are documented in Table FMP-10 and Section 4.9. The assessment is based on the extent to which the desirable levels and targets are satisfied during the 10-year plan period and over the long-term forecast for those indicators that span multiple 10-year terms. Some objectives cannot be assessed during the production of the plan and are assessed during plan implementation and reported in Annual Reports. Table FMP-10 provides a summary of the timing of assessment for each indicator.

The indicators of sustainability assessed during development of the plan were within the desirable levels or showing movement towards acceptable levels established to balance the achievement of multiple objectives (e.g. wood supply and biodiversity objectives). Section 6.5 of the Analysis package describes the achievement of objectives associated with the strategic direction (LTMD). An additional model run (comparison of proposed operations to the LTMD SFMM run or 'A139' run) was also completed to evaluate the performance of planned operations relative to the long-term management strategy. The model results and analysis show that the planned operations meet the intent of the LTMD (Section 4.9 of this document).

5.2 Spatial Assessments

The spatial assessment of sustainability considers the management objectives and indicators affected by the location of harvest areas, which includes the following indicators from the Boreal Landscape guide (2014):

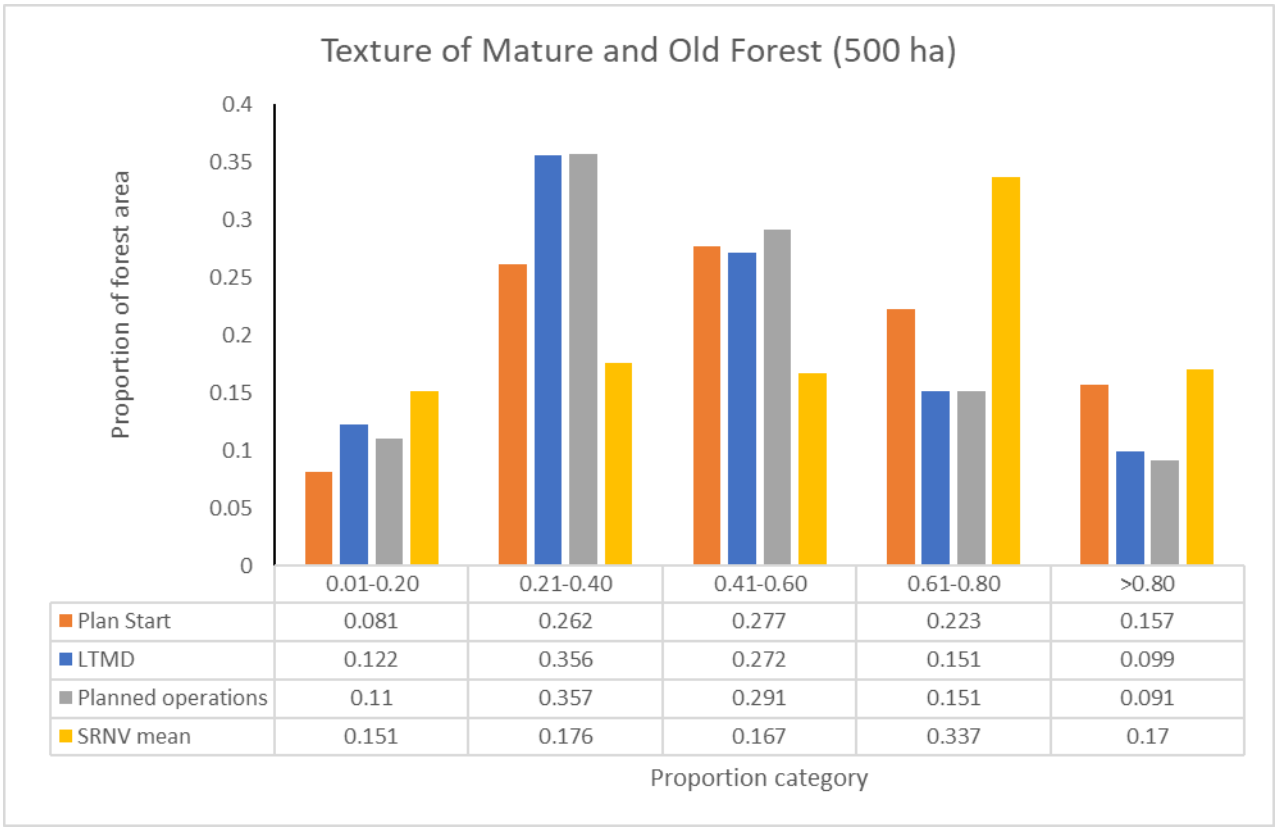
- *Mature Forest (5000 ha Scale)*
- *Mature and Old Forest (500 ha Scale)*
- *Young Forest Patch Size*

These indicators were assessed for the preferred harvest areas identified in the LTMD and the final planned harvest areas.

5.2.1 Mature and Old Forest

The mature forest indicators are intended to show the effects of operations on the density of mature forest across the landscape. The target of these indicators is to achieve the SRNV mean by plan end.

Figure 55, illustrates the frequency distribution of mature and old forest texture at the 500-hectare scale. Plan start and Plan end values for the LTMD projection and Planned operations are compared to the SRNV (i.e. the desired level).



	0.01-0.20	0.21-0.40	0.41-0.60	0.61-0.80	>0.80
Plan Start	0.081	0.262	0.277	0.223	0.157
LTMD	0.122	0.356	0.272	0.151	0.099
Planned operations	0.11	0.357	0.291	0.151	0.091
SRNV mean	0.151	0.176	0.167	0.337	0.17

Figure 55, Mature and old forest (500 ha scale) indicator performance for the LTMD projection and planned operations. The SRNV mean represents the target level for each proportion category.

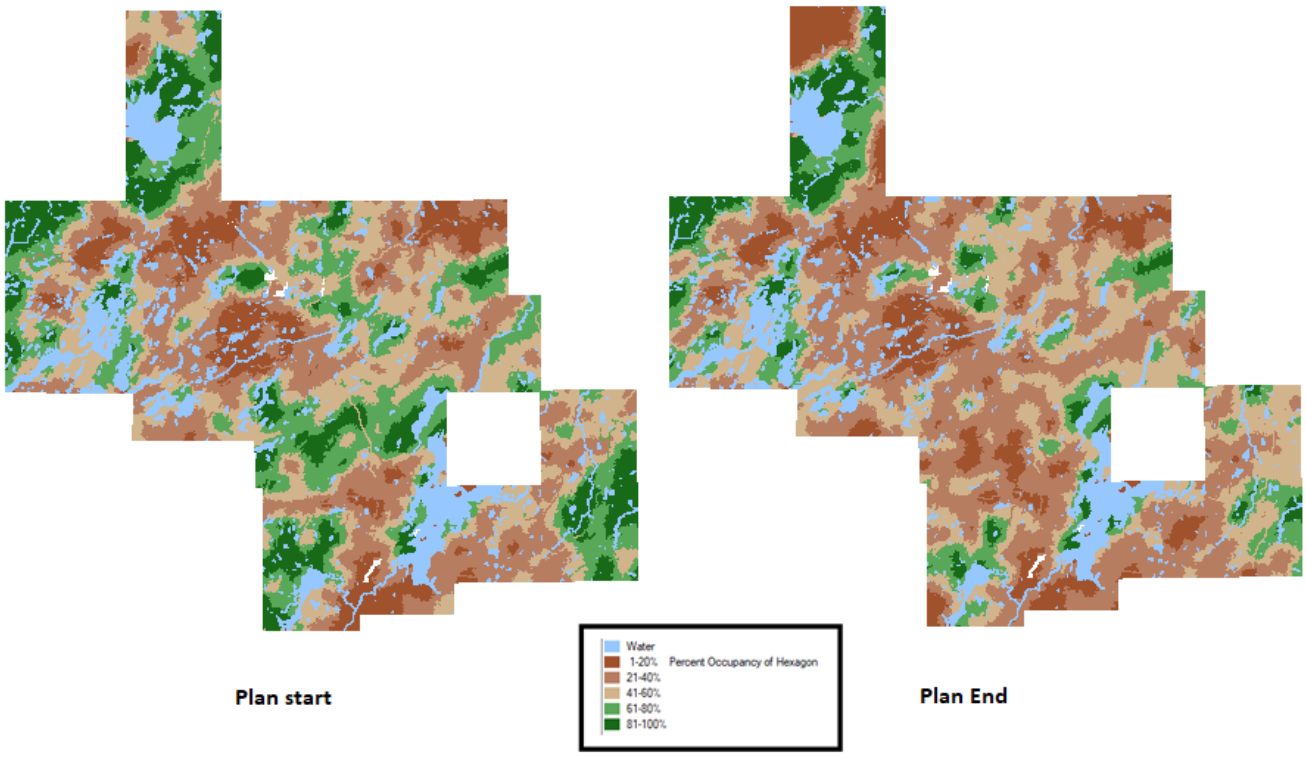
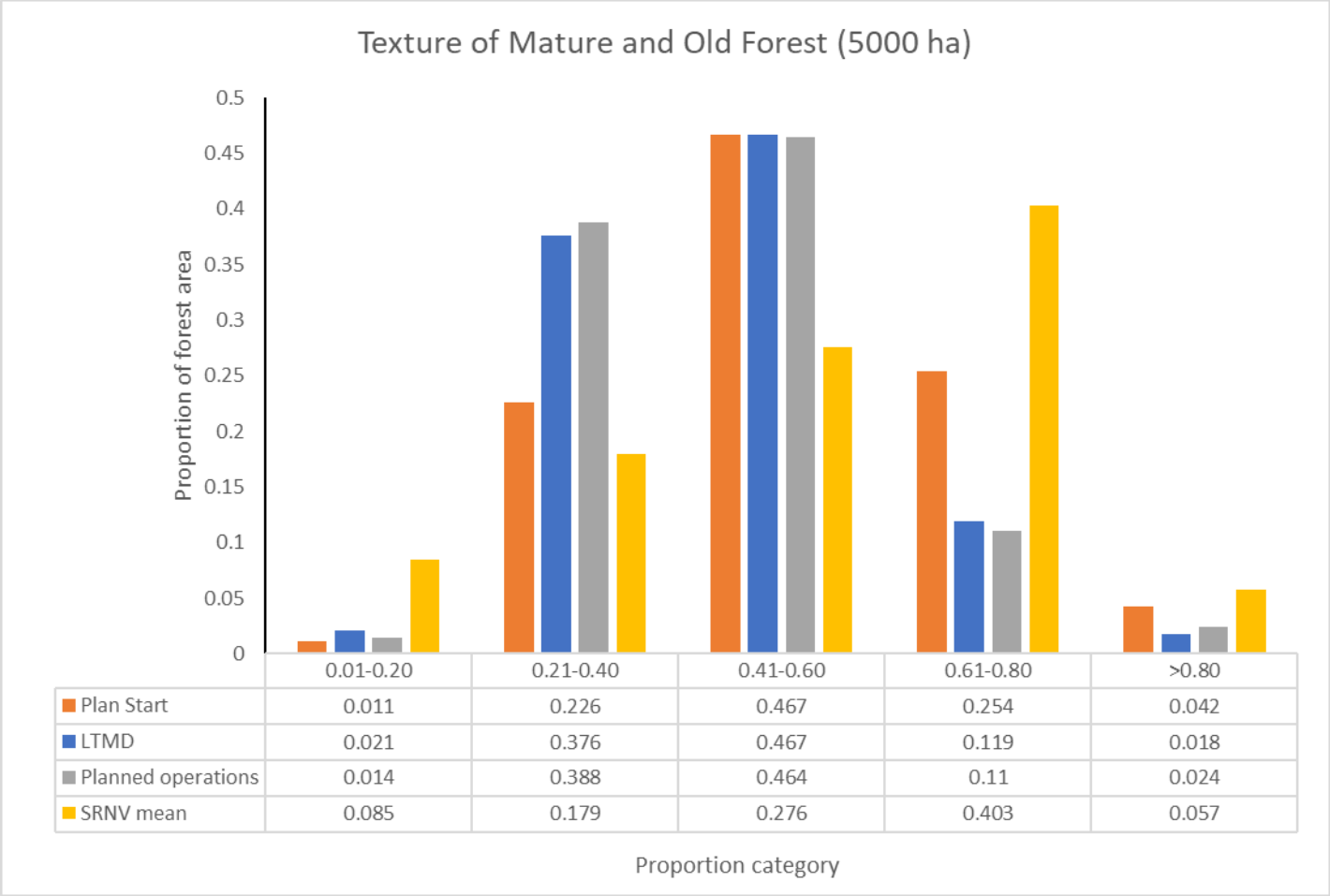


Figure 56,Texture of mature and old forest (500 ha scale) at plan start and plan end (planned operations v97)

The results indicate both planned operations and the LTMD do not achieve the desired level in any texture category.

Planned operations still causes movement towards the SRNV in the 1-20% category, but at a slower rate for this indicator that modeled in the LTMD. Planned operations also leads to additional movement away from the SRNV in the >80% texture category compared to the LTMD. Finally, planned operations causes movement away in the 41%-60% texture category, whereas the LTMD projection causes movement towards the SRNV. Achievement in the 21-40% and 61-80% categories are maintained from the LTMD to planned operations

In general, the texture proportions of planned operations are relatively consistent with the LTMD projection across all 5 categories.



	0.01-0.20	0.21-0.40	0.41-0.60	0.61-0.80	>0.80
Plan Start	0.011	0.226	0.467	0.254	0.042
LTMD	0.021	0.376	0.467	0.119	0.018
Planned operations	0.014	0.388	0.464	0.11	0.024
SRNV mean	0.085	0.179	0.276	0.403	0.057

Figure 57, Mature and old forest (5000 ha scale) indicator performance for the LTMD projection and planned operations. The SRNV mean represents the target level for each proportion category.

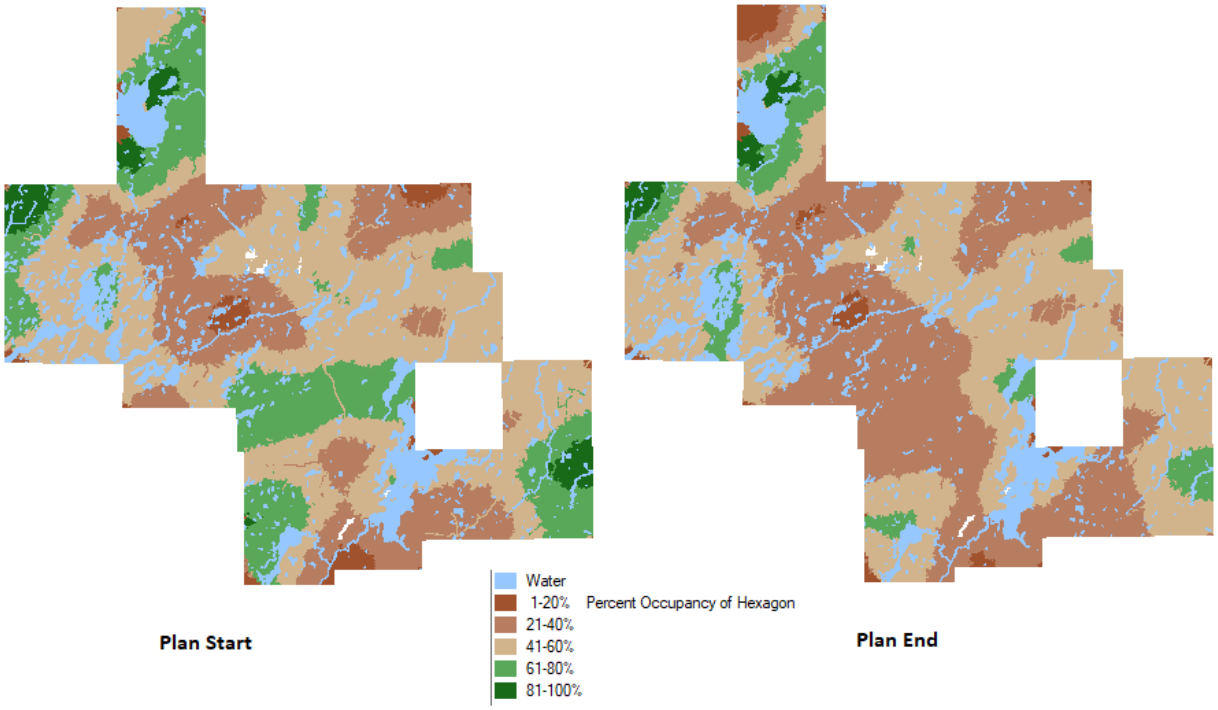
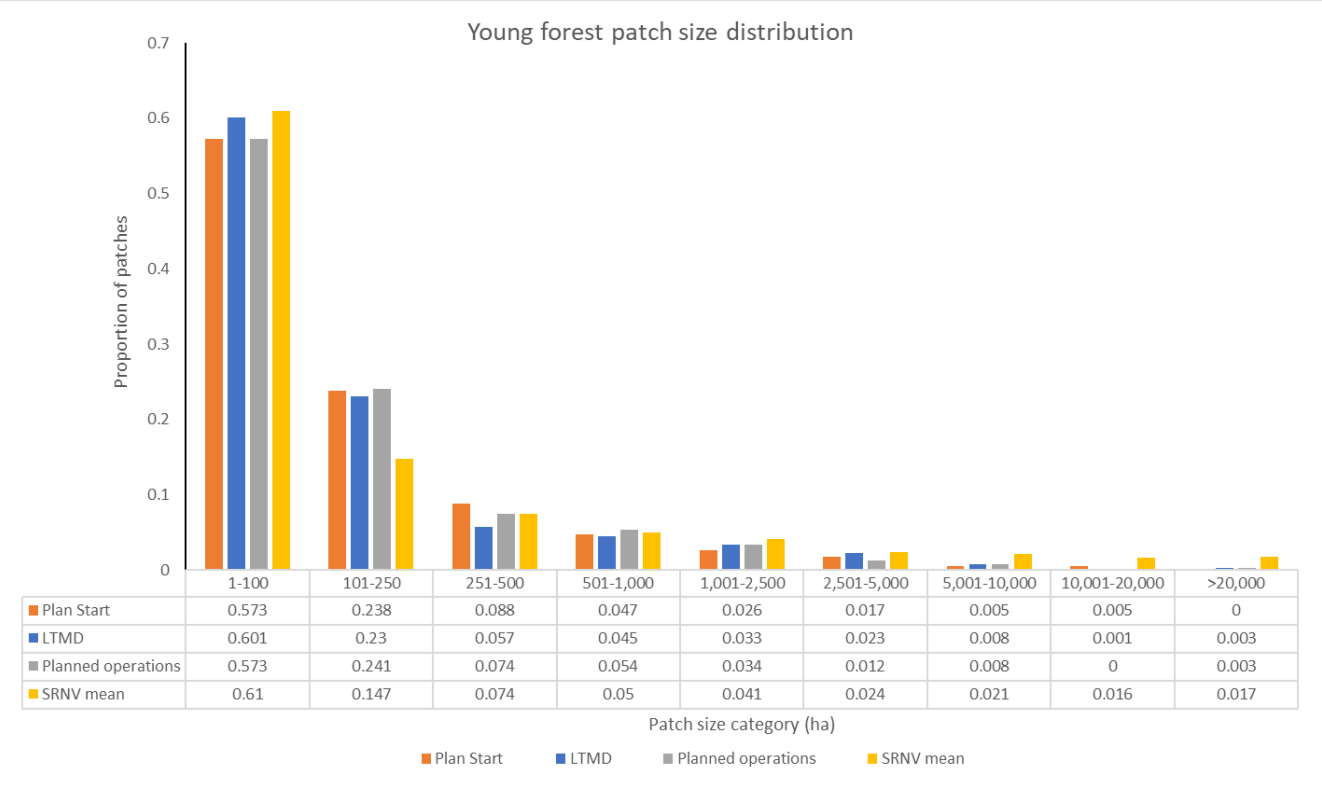


Figure 58. Texture of mature and old forest (5000 ha scale) at plan start and plan end (planned operations v97).

The results indicate planned operations cause less movement towards the SRNV for 1-20% mature forest hexagons. Planned operations also cause additional movement away from the SRNV in the 21-40% and 61-80% hexagon categories relative to the LTMD projection. Planned operations causes movement towards more movement towards the SRNV in the 41-60% and less movement away in the >80% texture categories relative to the LTMD.

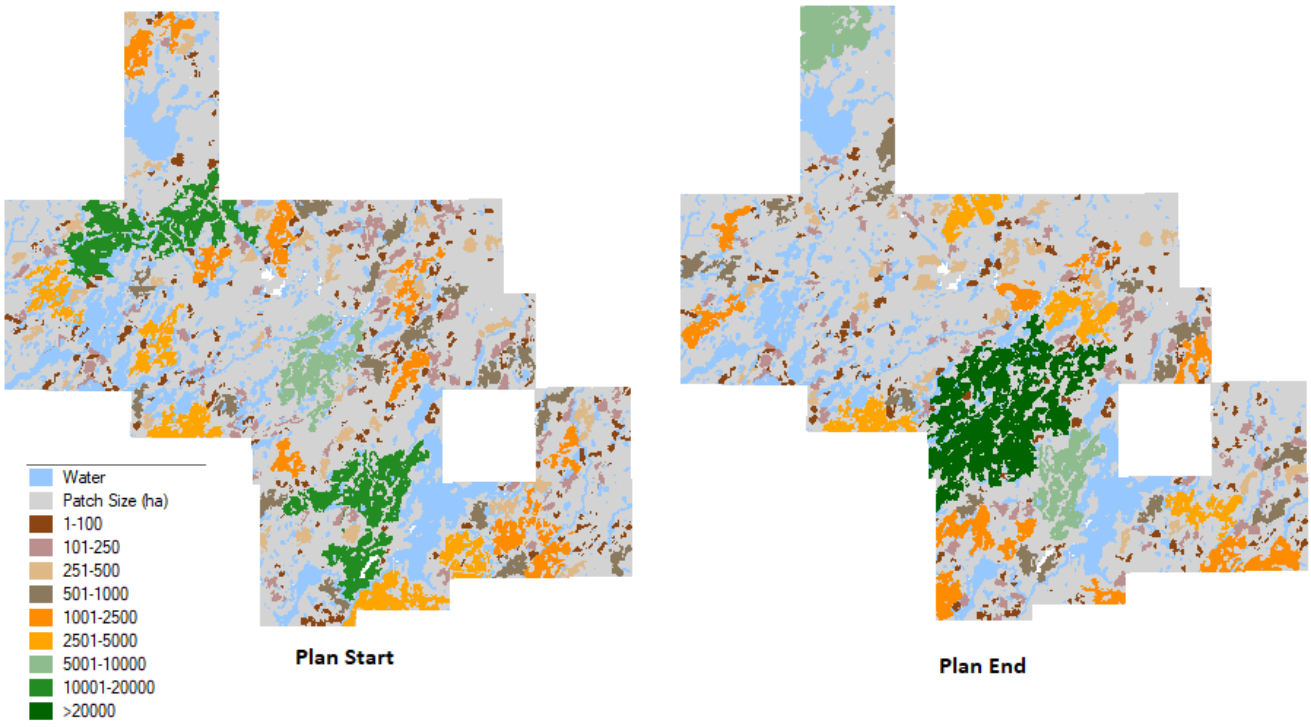
In general, the texture proportions of planned operations trend consistently with the LTMD projection across all 5 categories.

5.2.2 Young Forest Patch size



	1-100	101-250	251-500	501-1,000	1,001-2,500	2,501-5,000	5,001-10,000	10,001-20,000	>20,000
Plan Start	0.573	0.238	0.088	0.047	0.026	0.017	0.005	0.005	0
LTMD	0.601	0.23	0.057	0.045	0.033	0.023	0.008	0.001	0.003
Planned operations	0.573	0.241	0.074	0.054	0.034	0.012	0.008	0	0.003
SRNV mean	0.61	0.147	0.074	0.05	0.041	0.024	0.021	0.016	0.017

Figure 59, Young forest patch size distribution for the LTMD and planned operations across all size classes.



Planned operations show less movement towards the SRNV in the 1-100 ha category and movement away in the 101-250, 501-1000, 2501-500, and 10001-20000 patch size categories. Planned operations shows the same level of achievement as the LTMD in the 1001-2500, 5001-10000, and >20,000 ha patch size categories. Planned operations meets the SRNV in the 250-500 ha category where the LTMD does not.
Overall, planned operations show a similar young patch size distribution to the projection of the LTMD.

5.3 Protection of Values and Important Ecological Features

A multi-disciplinary planning team, including professional foresters and biologists, have considered the forest values dependent on forest cover in the development of the FMP. The Planned Operations have been modified as per relevant guidelines and direction to provide for the sustainability of other natural resource values such as wildlife habitat, fisheries, and aesthetics. These resource values provide for economic benefits such as hunting, angling, camping and remote tourism.

Negative environmental impacts have been minimized or prevented through the identification of natural resource values, and the application of Area of Concern (AOC) prescriptions and Conditions on Regular Operations (CROs). These prescriptions and conditions have been developed by the planning team, with the assistance of provincial guidelines for the protection of specific values and have been reviewed by plan advisors.

Many other users of the forest including the public have been consulted in the development of creative solutions to the complex problems and issues arising from competing demands for natural resources. The planning team has worked to attain an acceptable balance of plan objectives which attempt to integrate forest diversity objectives with objectives for wildlife habitat management, recreation, tourism, heritage values, sustainable harvest flow and environmental protection.

5.4 Social Economic assessment

For the long-term management direction, a social and economic assessment was completed (Section 3.7.5) to determine what, if any, impacts the LTMD would have on forest-sector employment and other forest-based industries. It compared the LTMD with the 2011 FMP in terms of harvest volume, silviculture expenditure, and associated employment income and considered the impacts that forest management activities may have on other forest-based industries. Planned net merchantable harvest volumes were within a reasonable margin of the projections for the 2011 plan, thus a qualitative social economic analysis was conducted.

The qualitative social and economic analysis comparing the 2011 Nagagami FMP to the proposed LTMD of the 2021 Nagagami FMP indicated no notable effect on the social economic indicators. As well, it provided a discussion on how negative impacts to other forest-based industries would be mitigated throughout the planning process.

Table 30, Planned Harvest volume for the 2011-21 and 2021-31 FMPs (Per FMP-13).

Volume type	2011-21	2021-31	2021/2011
Conifer (all Spp.)	2,480,891	2,845,960	0.87
Hardwood (all Spp.)	1,980,622	1,711,909	1.16
Total	4,461,513	4,557,869	0.98

5.5 Risk Assessment

Risks that some plan objectives that can impact the future forest condition and desired benefits may not be fully achieved during the implementation of the FMP are acknowledged. Impacts may affect social, economic, or environmental values (alone or in combination). Forest management planning relies on a precautionary approach in dealing with uncertainty and follows an adaptive management process to mitigate against risks. This is a foundation of the environmental values considered in the development of the FMP (refer to Supplementary Documentation 6.1 (o), Statement of Environmental Values for more detail).

A primary source of risk is a potential continuation of uncertain market conditions for wood fibre. During the current and previous planning cycles the level of utilization has been quite low, especially for some forest types and species groups (e.g. pulpwood and OSB grade fibre). This is largely reflective of market conditions and high costs associated with accessing some parts of the forest where utilizable volumes are low.

Local and global markets, economies, and international trade also affect the implementation of the FMP. Market conditions and demand for forest products fluctuate over a ten-year period and can influence the level of harvest, as seen in previous FMPs. Harvest levels have typically been lower than what is available in each FMP and this trend may continue well into the 2021-2031 period. A consequence of continued low harvest levels is the inability to reach the full potential of economic opportunities and related social benefits. Employment levels, in terms of both direct and indirect jobs, and revenues associated with historically low harvests are significantly lower than the expectations associated with full utilization of the available harvest.

A low-level of forest disturbance through harvesting can be favorable to objectives that rely on mature and old forest, however is unfavorable to objectives that rely on the creation of young forest and early successional forest types (i.e. forest types that primarily consist of Jack pine, Poplar, and White birch). This can also lead to increases in late/successional forest types and balsam fir. An increase in balsam fir (the least marketable of the species that contribute to the SPF product group), would be unfavourable as it could further contribute to the low utilization potential of the forest. Reduced harvest levels may also pose a risk to achieving the ideal mix of habitat for moose.

Harvesting that stimulates the production of deciduous saplings, which is a significant source of browse, is important to the successful maintenance and enhancement of Moose Emphasis Areas (MEAs). The projected plan-end habitat and carrying capacity for moose within the MEAs assumes

that all allocated areas will be harvested. If some areas are left uncut, browse stimulation in these areas will be reduced.

Spatial pattern objectives are also sensitive to actual harvest levels, as less harvesting would result in a longer timeline to reach the desired disturbance pattern. Fewer or smaller patches may be favourable for the smaller patch size classes while unfavourable for the larger classes that are currently at a lower frequency than the desired natural pattern (i.e. patches larger than 5,000 ha). Harvest levels also affect the assessment of mature and old forest texture (at 500 ha and 5000 ha scale). Low harvests will contribute to a build-up of higher concentration areas of mature and old forest.

Current and projected changes in the workforce demographics also present a challenge to maintaining a continuous and predictable supply of wood to mills. Truck drivers, mill workers, and loggers are (at times) in short supply, and the future change-over and recruitment within the workforce could potentially limit the ability to fully utilize the Available Harvest Area. While outside the scope of the FMP, this issue is being considered with company business planning.

Over the course of the ten-year plan there may also be changes at a political or regulatory level that affect the implementation of the FMP. Changes to policy requirements (i.e., species at risk or land tenure) may result in lower utilization of otherwise operational harvest areas.

Climate change also poses a potential threat to the health and condition of the forest, and the timing and magnitude of these effects are uncertain. Weather patterns (e.g., wet autumn conditions, late freeze-up or early winter thaws), may pose a risk to accessing harvest areas that require the use of winter roads or frozen ground. This may constrain the availability or feasibility of accessing some winter harvest areas. The use of winter roads is mandated in specific areas of the forest by land use direction (CLUPA) or sensitive sites (wet, fine textured or organic soils). Annual Work Schedules may, therefore, need to be revised periodically to accommodate changing weather conditions. The adaptive management process of monitoring and subsequent planning is an important aspect of addressing climate change.

The incidence of wildfires has been relatively low on the Nagagami forest under modern fire suppression, although there have been periodic fluctuations. Climate change, however, may result in increases in the occurrence and severity of fires. This is mitigated through effective, rapid response of the fire control program and fire prevention and preparedness strategies (section 4.8 and adaptive management. Salvage opportunities also offset the impacts of fire, insect, disease, and weather-related damages through the recovery of damaged trees. Planned harvest and renewal activities also mitigate against the accumulation of higher fuel loads with the dispersion of young forest and hardwood (e.g., poplar) to create a landscape pattern that emulates the natural condition and is more resilient to fire.

The risks to successfully implementing the FMP are mitigated with a well-balanced strategy and adaptive management process. A mid-term evaluation of the FMP progress is required to ensure successful implementation, or potentially a need for revised direction. The periodic planning cycle for forest management, requiring a re-evaluation and new plan every 10 years also provides the opportunity to respond to unforeseen challenges or risks.

5.6 Conclusion

The collective assessment of the management objectives indicates the 2021-2031 Nagagami Forest Management Plan objectives are being met and progress is being made towards the desired forest conditions and benefits. The social and economic assessment indicates that current levels of social or economic benefits are projected to be maintained for the 2021-2031 term.

The LTMD and planned operations were developed by the planning team with consideration to plant and animal life, water, soil and air quality, and social and economic values including recreational values and cultural heritage values. The assessment of objective achievement, social and economic assessment, risk assessment, and the long-term management direction (LTMD) have all demonstrated that the 2021-2031 FMP for the Nagagami Forest provides for the sustainability of the Crown forest.